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No. 87-1228

In the Supreme Court

OF THE

United States

OCTOBER TERM, 1987

PENNWALT CORPORATION
Petitioner,
vs.
DURAND-WAYLAND, INC.,
Respondent,
Cross-Petitioner.

CROSS-PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

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QUESTIONS PRESENTED FOR REVIEW

This is a Cross-Petition of Durand-Wayland to be considered only if the Petition of Pennwalt Corporation is granted. This patent case deals with the issues of validity and infringement decided by the Court of Appeals for the Federal Circuit, sitting in banc. The majority was unable to determine that the District Court's finding of non-infringement literally or under the doctrine of equivalents was not clearly erroneous and properly affirmed the judgment of non-infringement. However, having found in favor of the Cross-Petitioner (Respondent) on the issue of infringement, the Court summarily dismissed Durand-Wayland's Cross-Appeal asserting that Durand-Wayland had not shown that the district court's refusal to find the case exceptional and to award attorney's fees was based on clearly erroneous findings (A-15,16). The Court then vacated that part of the judgment concerning the issue of validity raised in the Cross-Appeal as moot because there was no indication that validity extended beyond the litigated claims of the devices found to be non-infringing.

The questions presented for review are:

(1) Can an issue of validity be dismissed as moot in light of Supreme Court precedence holding that public policy is against the preservation of an invalid patent which may inhibit the use of the invention, otherwise belonging in the public domain?

(2) Is it error for the Court of Appeals to dismiss a Cross-Appeal by holding the issue of validity of a patent to be moot, thereby depriving the party asserting invalidity of the possibility of recovering its attorney's fees, in the event that the patent were held invalid because of inequitable conduct in the prosecution of the patent or because the invention of the patent-in-suit was "on sale"

for more than one year prior to the filing of the application for the patent-in-suit?

(3) Is it error to dismiss a Cross-Appeal as moot, rendering no decision on the issues raised?

STATEMENT OF INTEREST UNDER RULE 28.1

Cross-petitioner, respondent, Durand-Wayland, Inc., has no parent companies, subsidiaries or affiliates.

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CITATION OF OPINIONS BELOW

The opinion of the Court of Appeals for the Federal Circuit is reported at 833 F.2d 931, 4 U.S.P.Q. 2d 1737, and is reprinted in the Appendix hereto at page A-1.

The opinion of the District Court is reported at 225 U.S.P.Q. 558 and is reprinted in the Appendix at page A-90.

The unpublished Supplemental Orders of the District Court are reprinted in the Appendix at page A-126.

The judgment of the District Court is reprinted in the Appendix at page A-177.

JURISDICTIONAL STATEMENT

The judgment of the Court of Appeals for the Federal Circuit was entered on November 6, 1987 and the mandate issued November 27, 1987. This Court has jurisdiction under 28 U.S.C. § 1254 (1). This is a Cross-Petition filed under Supreme Court Rule 19.5. The Petition for Certiorari in connection with this Cross-Petition was received by the Cross-Petitioner on January 25, 1988.

CONSTITUTIONAL PROVISION AND STATUTES INVOLVED

Constitution of the United States, Article I, Section 8, Clause 8:

The Congress shall have Power . . . to promote the Progress of Science and useful Arts, by securing for limited times to Authors and Inventors the exclusive Right to their respective Writing and Discoveries. . . .

35 U.S.C. § 102(b):

A person shall be entitled to a patent unless —

(b) The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States.

35 U.S.C. § 282:

A patent shall be presumed valid. Each claim of a patent (whether in independent, dependent or multiple dependent form) shall be presumed valid independently of the validity of other claims; dependent of multiple dependent claims shall be presumed valid even though dependent upon an invalid claim. The burden of establish-

ing invalidity of a patent or any claim thereof shall rest on the party asserting such invalidity.

The following shall be defenses in any action involving validity or infringement of a patent shall be pleaded:

(1) Noninfringement, absence of liability for infringement or unenforceability,

(2) Invalidity of the patent or any claim in suit on any ground specified in part II of this title as a condition for patentability,

(3) Invalidity of the patent or any claim in suit for failure to comply with any requirement of sections 112 or 251 of this title.

(4) Any other fact or act made a defense by this title.

In actions involving the validity or infringement of a patent the party asserting invalidity or non infringement shall give notice in the pleading or otherwise in writing to the adverse party at least thirty days before the trial, of the country, number, date and name of the patentee of any patent, the title, date, and page numbers of any publication to be relied upon anticipation of the patent-in-suit or, except in actions in the United States Claims Court, as showing the state of the art, and the name and address of any person who may be relied upon as the prior inventor or as having prior knowledge of or as having previously used or offered for sale the invention of the patent in suit. In absence of such notice proof of the said matters may not be made at the trial except on such terms as the court requires.

35 U.S.C. § 285:

The Court in exceptional cases may award reasonable attorney fees to the prevailing party.

37 C.F.R. § 1.56(a):

A duty of candor and good faith toward the Patent and Trademark Office rests on the inventor, on each attorney or agent who prepares or prosecutes the application and on every other individual who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application. All such individuals have a duty to disclose to the Office information they are aware of which is material to the examination of the application. Such information is material when there is a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a patent. The duty is commensurate with the degree of involvement in the preparation of prosecution of the application.

STATEMENT OF THE CASE

The Petitioner, Pennwalt Corporation (Pennwalt), initiated this suit alleging patent infringement against the Respondent/Cross-Petitioner, Durand-Wayland, Inc., in the United States District Court for the Northern District of Georgia, charging infringement of U.S. Patent 4,106,628 (hereinafter the '628 patent or the patent-in-suit). (A-183) Durand-Wayland counterclaimed in part for a declaratory judgment that the '628 patent was invalid. The counterclaim asserted that the patent-in-suit, *inter alia*, was invalid because the invention thereof was "on sale" more than one year prior to the application date for the '628 patent, and the '628 patent was unenforceable for failure of the inventors and their attorney to meet their duty of candor to the United States Patent and Trademark Office. Durand-Wayland also contended that

the "on sale" bar and failure to reveal prior art (the Sunkist Machine (A-181, 182)) was inequitable conduct by the Petitioner, Pennwalt, entitling Durand-Wayland to an award of attorney's fees.

The district court found that the '628 patent was valid, but not infringed. The judgment of non-infringement followed after a finding that the claims were not literally infringed or infringed under the doctrine of equivalents. The district court, however, failed to award attorney's fees to the prevailing party. (*See* Final Judgment of the District Court (A-177)).

Pennwalt appealed the district court's decision on the infringement issue to the U.S. Court of Appeals for the Federal Circuit. (Opinion at A-1) Durand-Wayland cross-appealed the validity decision asserting that the district court erred by failing to hold the Pennwalt Patent invalid and by failing to hold, *inter alia*, that the patent-in-suit was invalid because it was "on sale" by Tilt Belt, the predecessor[1] of Pennwalt more than one year prior to the filing of the patent application and thus ineligible for a patent grant under 35 U.S.C. § 102(b) and by failing to hold that Pennwalt's failure to reveal the "on sale" status of the invention and a secret Sunkist Machine known as prior art by the predecessor of Pennwalt, was inequitable conduct before the Patent and Trademark Office. Since both the "on sale" bar and failure to reveal pertinent known prior art give rise to a possible award of attorney's fees under 35 U.S.C. § 285, the failure to rule on these issues has unjustly deprived Durand-Wayland of an opportunity for an award of attorney's fees.

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[1] Contemporaneous document proof of the machine being "on sale" is shown by the Alexander & Baldwin purchase order (A-196) and the Williamson internal record (A-198).

The United States Court of Appeals for the Federal Circuit ultimately affirmed the decision of the lower court regarding the issue of infringement both literally and under the doctrine of equivalents. The court of appeals, however, dismissed Durand-Wayland's Cross-Appeal as "moot", and surprisingly, vacated the district court's decision as to validity, thereby implying that the holding of the trial court as to validity was flawed, but did not state why. (A-16) It is from the dismissal of the Cross-Appeal as moot that Durand-Wayland seeks the review of this Court.

In holding the issue of validity moot, the Federal Circuit failed to rule on any of Durand-Wayland's numerous defenses and failed to reverse, as a matter of law an "on sale" decision of the trial court and also failed to conclude that because of the known "on sale" bar and because of the failure to reveal the Sunkist Machine (a machine on which inventor Mills worked on) to the Patent and Trademark Office, Pennwalt's predecessor was guilty of inequitable conduct. The patent-in-suit which should be invalid remains valid, thereby depriving the public of its rights with respect to the patent grant and Durand-Wayland of possible recovery of its attorney's fees. It appears that the court of appeals simply excused itself from the burden of hearing and deciding the Cross-Appeal.

BASIS FOR JURISDICTION IN THE DISTRICT COURT

The District Court's jurisdiction in this action is based on 28 U.S.C. § 1331, 1332(a)(1) and 1338. The jurisdiction of the Court of Appeals for the Federal Circuit is based on 28 U.S.C. § 1292(c) and § 1295(a).

ARGUMENT

The Court of Appeals for the Federal Circuit under 28 U.S.C. § 1295(a)(1) has exclusive jurisdiction over patent cases on appeal from district courts. With the exception of the U.S. Supreme Court, the Federal Circuit, has unchecked authority in forming patent case law. In the present case, the decision of the Federal Circuit determining that the issue of validity is moot once the issue of non-infringement was decided, fails to protect the public from the existence of this invalid patent. Furthermore, the failure to rule on the Cross-Appeal deprived Durand-Wayland of properly awarded attorney's fees in this case.

I.

PUBLIC POLICY SET BY SUPREME COURT PRECEDENT REQUIRES THAT INVALID PATENTS BE ERADICATED WHENEVER A COURT IS GIVEN AN OPPORTUNITY TO SO ACT.

It is submitted that holding the issue of validity as moot has violated a strong public policy set forth by Supreme Court precedent favoring the eradication of invalid patents.

Lear v. Adkins, 395 U.S. 653 (1969) espouses the public nature of a patent and the value to the public in eradicating those patents that are not valid. However, prior to that Supreme Court decision, there has been support of the policy enunciated in *Lear* to protect the public from invalid patents.

One can, in examining the public policy of the eradication of invalid patents, begin with the primary purpose of the patent system as stated by the language of the Constitution of the United States "to promote the pro-

gress of science and use arts." U.S. Const. Art. I, § 8, cl. 8.

> "It is not the principal purpose of patent laws of one country or of any nation to reward an individual. The purpose is much deeper and the effect much wider than individual gain. It is the promotion of science and the advancement of the arts looking to the general welfare of the nation that patent laws hope to accomplish. The individual reward is only the lure to bring about this much broader objective. Every patent granted benefits society by adding to the sum total of human knowledge, but that is not enough, and that alone will not achieve the ultimate goal of the patent system". *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 331 n.1 (1945) (*citing* the testimony of Commissioner Coe before the TNEC Hearings Part 3, p.857).

Thus, the patent system's inducement is directed to disclosure of advances in knowledge which will be beneficial to society. It is not a certificate of merit, but an incentive to disclose. It is not concerned with the quality of the inventor's mind but the quality of his product. *Sinclair*, 325 U.S. at 331.

It is with this premise in mind that patent protection should be viewed. However, if a patent exists on the record that, in reality, is invalid, it violates this policy of the promotion of the arts and sciences and hoards an idea rightfully within the public domain, disguising it as a grant of exclusive rights protected by the patent laws. Prior to the *Lear* decision, there were many recognitions of the public nature of a patent, inferring that the issue of validity is not moot regardless of the outcome of an infringement determination.

The concurring opinion in *Aero Spark Plug Co. v. B & G Corporation*, 130 F.2d 290 (2nd Cir. 1942) favors a finding as to validity in every case, regardless of the decision on infringement. There, the district court had dismissed an infringement action on the ground of noninfringement and invalidity of the claim in issue. The Court of Appeals affirmed the noninfringement but failed to decide the question of patent validity because of the resolution of noninfringement. Judge Frank concurred with the result of the appellate decision, but felt that the patent should also have been held invalid. Judge Frank felt that it was the duty of the Court, when the issue was raised, and a patent was invalid, to affirmatively decide the issue, stating:

> "There is more at stake [in a patent case] than the issue between two parties. The decision of my colleagues relieves the appellees but leaves the appellant free to sue others as alleged infringers putting them to the expense — notoriously great in patent suits of defending themselves. It is well known too that threats of such suits because of that expense, often entice alleged infringers to accept licenses on erroneous terms rather than to engage in litigation. As the exercise of a patent monopoly is publicly injurious when an invalid patent remains at large, the public interest is therefore deeply involved." *Id.* at 292.

Judge Frank then noted:

> "A patent is a public franchise, a legalized monopoly. To allow a patent to remain apparently valid when the issue of invalidity is raised and the Court sees that the patent is invalid is to ignore the paramount public interest." *Id.* at 293.

Altvater v. Freeman, 319 U.S. 359 (1943) determined, in a patent suit, where there was a counterclaim for declaratory judgment regarding validity, that a dismissal on the ground of non-infringement does not render moot the issue of validity where the counterclaim goes beyond the single claim and accused devices in issue.

The decision in that case turned on the defendant's remaining obligation to pay royalties under a licensing agreement as a basis for justiciability. Justice Frankfurter's dissent was that a declaratory judgment on that ground was improper due to the minimal need for relief by the defendant. However, in so dissenting he noted:

> "It may very well be that one who infringes a patent should be entitled to obtain a declaration as to its validity even though he is under no contractual obligation to pay royalties as a licensee. The existence of an invalid patent may substantially impair the economic position of those who market articles which infringe such a patent, even though no infringement suits may be immediately threatened. Potential purchasers may naturally be reluctant to establish business relations upon so insecure a basis. But the Court has not chosen to sustain the propriety of a declaratory judgment here on this ground and it is therefore idle to consider the merits." *Id.* at 371.

Thus, the suggestion remains that the far reaching effects of maintaining an invalid patent to be protected by patent laws is a "real and substantial" and "definite and concrete" controversy to a potential or alleged infringer of a patent and such controversy can merit a determination by declaratory judgment. *See Aetna Life Insurance Co. v. Haworth*, 300 U.S. 227, 240-41 (1937).

This Court later gave direct support to the argument that the issue of validity is not moot for public policy reasons in *Lear v. Adkins*, 395 U.S. 653 (1969). In determining that a licensee was not estopped from attacking the validity of a patent, this Court stated:

> "It is as important to the public that competition should not be repressed by a worthless patent, as that the patentee of a really valuable invention should be protected in his monopoly" *Id.* at 668-64. (*citing Pope Manufacturing Co. v. Gormully*, 144 U.S. 224, 234 (1892)).

This Court in *Lear* also found that licensees were not required to continue to pay fees accruing during the time they are challenging the patent validity in the Courts. This Court held that to enforce such a contractual provision "would undermine the strong Federal policy favoring the free and full use of ideas in the public domain". *Id.* at 674.

While the *Lear* decision did not directly decide the issue at hand, i.e. whether failing to rule on validity while vacating a judgment of validity as moot is error, it sets forth the clear policy in patent law that, whenever an invalid patent can be eradicated, the court should take every possible action to do so.

Thus, as a matter of public policy, a validity issue should never be declared moot regardless of validity of the patent, due to the strong policy favoring the elimination of invalid patents and the full use of ideas in public domain, particularly where the issue of validity is raised by way of a declaratory judgment claim.

In *Blonder-Tongue Lab., Inc. v. University of Illinois Foundation*, 402 U.S. 313 (1971) this Court again recognized the public nature of patents in determining that a

patentee is estopped from asserting the validity of a patent if the patent has been declared invalid in a previous suit. This Court, *citing Precision Instrument Manufacturing Co. v. Automotive Maintenance Machinery Co.*, 394 U.S. 806, 816 (1945), stated:

> "a patent by its very nature is affected with a public interest. [It] is an exception to the general rule against monopolies and to the right to access to a free and open market. The far-reaching social and economic consequences of a patent therefore give the public a paramount interest in seeing that patent monopolies spring from backgrounds free from fraud or other inequitable conduct and that such monopolies are kept within the legitimate scope." *Id.* at 343.

It is clear that this Court has recognized the public interest, in not only rewarding inventors with the incentive to develop new ideas, but it should also protect the public and Durand-Wayland who has spent large sums of money to ferret out the wrong doings of Pennwalt, by determining that the patent-in-suit is invalid and by awarding attorney's fees to Durand-Wayland. It is clear that an invalid patent which exists as valid has far reaching economic consequences and for this reason alone, the Court should encourage the eradication of this invalid patent.

It is thus clear that the validity of a patent is never a moot issue. A court should, as a matter of course, be required to examine the validity of a patent to promote the policy favoring free and full use of ideas in the public domain.

Judge Frank summarized the failure to decide the validity of a patent as follows:

> "[If] we must here choose between deciding that a patent is not valid or not infringed . . . our choice should be the former . . . among abuses is the persistence of "spurious" patents. To shift the metaphor, they are vicious zombis. Their attacks on the public interest bring the patent system into disrepute." *Aero Spark Plug Co. v. B & G Corp.*, 130 F.2d 240, 299 (2nd Cir. 1942).

The more recent case of *Hieger v. Ford Motor Co.*, 516 F.2d 1324 (6th Cir. 1975) stated the issue as follows:

> It is now well recognized that an invalid patent is a blight on the important public interest in permitting full and free competition in the use of ideas in the public domain *Lear v. Adkins*, 395 U.S. 653 (1969), and should be expunged whenever the issue can be reached.

Thus for public policy reasons, this Court is respectfully requested to vacate the decision by the U.S. Court of Appeals for the Federal Circuit that the issue of validity is moot and remand the case to review the issue of validity.

II.

THE COURT OF APPEALS FOR THE FEDERAL CIRCUIT ERRED AS A MATTER OF LAW IN VACATING THE ISSUE OF PATENT VALIDITY AS MOOT AND DEPRIVED DURAND-WAYLAND OF THE OPPORTUNITY TO RECOVER ATTORNEY'S FEES UNDER 35 U.S.C. § 285.

It is submitted by the Cross-Petitioner, Durand-Wayland, that not only does the decision of the U.S. Court of Appeals for the Federal Circuit violate public policy in vacating the issue of validity in this case as moot, but that

decision is also error as a matter of law. Supreme Court precedence supports a requirement that the issue of validity should always be decided and the Court is respectfully requested to so hold in this case. Furthermore, Durand-Wayland asserts that the district court erred as a matter of law in failing to determine that the patent-in-suit is invalid due to an "on sale" bar. It was also error to fail to examine the inequitable conduct of the predecessors of Petitioner and its attorneys in dealing with the Patent and Trademark Office by failing to disclose that the invention was "on sale" more than one year prior to the filing of the patent application and by failure to disclose known prior art. Both the "on sale" bar and inequitable conduct in the Patent and Trademark Office give rise to the award of attorney's fees under 35 U.S.C. § 285. By failing to review these issues in the Cross-Appeal, the Federal Circuit has deprived Durand-Wayland of its opportunity to obtain attorney's fees. This Court is respectfully requested to remand this case to the Federal Circuit to examine the issue of validity and review the district court's decision on the awarding of attorney's fees in light of those findings.

A. The Issue Of Validity Should Have Been Decided Instead Of Vacated As Moot As A Matter Of Law.

The Patent Act gives a patent issued by the U.S. Patent and Trademark Office a presumption of validity. That presumption, however, is not a conclusive one. A defendant accused of infringement has at least two possible defenses to the alleged infringement; non-infringement and invalidity of the patent-in-suit. 35 U.S.C. § 282. Prevailing on either the defense of non-infringement or validity of the patent will relieve the alleged infringer of liability. However, two questions arise in asserting both defenses in a patent case. The initial question is which

issue should be decided first? The second is once either validity or infringement is decided, whether the remaining issue should be decided? Since these questions have generated a long history of case law, the discussion will be limited to the facts in the case at hand. It is clear at least at the district court level, that once a decision of infringement is reached, the better practice is to inquire fully into the validity of the patent. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 330 (1945). In the present case, the district court reached the issue of validity but misapplied the law. Once a determination of non-infringement has been reached, Durand-Wayland asserts the issue of validity should be affirmatively decided by the court of appeals as well. Otherwise, the appellee's Cross-Appeal is never heard at all.

The first Supreme Court case to review the issue of whether of validity should be addressed when there is a finding of non-infringement was *Electrical Fittings Corporation v. Thomas & Betts Co.*, 307 U.S. 241 (1939). The district court in that case entered a decree adjudging Claim 1 of the patent valid, but not infringed. The plaintiff did not appeal the judgment of non-infringement. The defendant, however, appealed to the Circuit Court of Appeals from so much of the decree as adjudicated Claim 1 valid. The appeal was dismissed on the ground that the suit had been terminated in the defendant's favor and the finding of validity would not bind the defendant in subsequent suits on the issue of validity.

This Court reversed, holding that an appeal should be entered in order to direct reformation of the decree to eliminate the finding as to validity, stating:

> "A party may not appeal from a judgment or decree in his favor for the purpose of obtaining a review of findings he deems erroneous which are not necessary

> to support the decree. But here the decree itself purports to adjudge the validity of Claim 1 and though the adjudication was immaterial to the disposition of the cause, it stands as an adjudication of one of the issues litigated. We think the petitioners were entitled to have this portion of the decree eliminated and that the Circuit Court of Appeals had jurisdiction . . . to entertain the appeal not for the purpose of passing on the merits but to direct reformation of the decree." *Id.* at 242.

Thus, in *Electrical Fittings* the Court determined that the issue of validity could be reversed on appeal and that the defendant had the right to a review of a ruling on validity even though no infringement was found.

Altvater v. Freeman, 319 U.S. 359 (1943) is a case on slightly different facts from the case at hand, but specifically holds that it is *error* for the Circuit Court of Appeals to treat as moot, a counterclaim of invalidity raised by a defendant.

In *Altvater*, the plaintiff sought specific performance on a patent license contract. The defendant filed a counterclaim for a declaratory judgment that the patent was invalid. The district court held that the defendant was not infringing the patent-in-suit, had not breached the license in issue and further held that the patent was invalid. The plaintiff's suit was dismissed, but the trial court granted a declaratory judgment of invalidity on the counterclaim. On a petition for rehearing, the Circuit Court of Appeals affirmed the decision on non-infringement and ruled that when the district court found no contract or license and no infringement, the other issues (namely the validity issue) were rendered moot because there was no longer a justiciable controversy between the parties.

This Court, however, reversed the court of appeal's action and directed it to consider the merits of a judgment of invalidity. This Court found that the Circuit Court of Appeals, in declaring the validity issue moot, had misinterpreted the decree in *Electric Fittings Corp. v. Thomas & Betts Co.*, 307 U.S. 241 (1939). The decision in *Electrical Fittings* was explained as follows:

> That case was tried only on a bill and answer. The District Court adjudged a claim of a patent valid although it dismissed the bill for failure to prove infringement. We held that the finding of validity was immaterial to the disposition of the cause and that the winning party might appeal to obtain a reformation of the decree. To hold a patent valid if it is not infringed is to decide a hypothetical case. [*citing Cover v. Schwartz*, 133 F.2d 54, (2nd Cir. 1942).] [B]ut the situation in the present case is quite different. We have here not only a bill and answer but a counterclaim. Though the decision of noninfringement disposes of the bill and answer, it does not dispose of the counterclaim which raises the question of validity. *Sola Electric Co. v. Jefferson Electric Co.*, 317 U.S. 173, 63 S.Ct. 172 is authority for the proposition that the issue of validity may be raised by a counterclaim in an infringement suit. The requirements of case or controversy are of course no less strict under the Declaratory Judgment Act . . . than in case of other suits . . . But we are of the view that the issues raised by the present counterclaim were justiciable and that the controversies between the parties did not come to an end . . . on the dismissal of the bill for noninfringement, since their dispute went beyond the single claim and the particular accused devices involved in that suit. *Id.* at 363.

Thus, it is clear under *Altvater* that it is error for a Circuit Court of Appeals to have declared the issue of validity moot, if the dispute goes beyond the claims of the patent that are allegedly infringed and the accused devices in the suit. Here, a finding of inequitable conduct before the Patent and Trademark Office would render all claims invalid. *J. P. Stevens & Co., Inc. v. Lex Tex, Ltd.*, 747 F.2d 1553 (Fed. Cir. 1984). In *Altvater* it was found that the dispute went beyond the single claims being litigated where there were many claims to the patent and the petitioners were selling additional articles claimed to fall under the patents for which they were paying royalties.

The *Altvater* decision, a 1943 decision, however, must be read in conjunction with the more recent policy decisions set forth by the Supreme Court in *Lear v. Adkins*, 395 U.S. 653 (1969) and *Blonder-Tongue Lab., Inc. v. University of Illinois Foundation*, 402 U.S. 313 (1971).

Even if Durand-Wayland did not assert the issue of validity beyond the litigated claims, when *Altvater* is examined in light of the clear public policy set forth in *Lear* and *Blonder-Tongue*, that invalid patents should be eradicated, the clear result is that the issue of patent validity is never moot when raised as a defense to infringement as permitted by 35 U.S.C. § 282, particularly by declaratory judgment counter claim.

The policy that this Court should adopt is that anyone who infringes a patent or is accused of infringing a patent should be entitled to obtain a declaration as to its validity even though he is under no contractual obligation to pay money. While this is statutorily supported by 35 U.S.C. § 282, Justice Frankfurter also suggested this in his

dissent in the *Altvater, supra*, decision. Justice Frankfurter states:

> "The existence of an invalid patent may substantially impair the economic position of those who market articles which infringe a patent." *Id.* 319 U.S. at 371.

B. Failure To Decide The Issue Of Validity Unjustly Deprived Durand-Wayland Of An Award Of Attorney's Fees.

The Court of Appeals for the Federal Circuit ignored the cross-appeal by Durand-Wayland that the district court erred in its refusal to award the prevailing party attorney's fees under 35 U.S.C. § 285. Generally, an award of a attorney's fees to the prevailing party in an exceptional patent case is within the discretion of the trial court and an appellate court will not counter that discretion unless there has been an abuse of discretion or there has been an erroneous conception of the law. *See Maurice A. Garbell, Inc. v. Boeing Co.*, 546 F.2d 297 (9th Cir. 1976).

In this case, the district court erred in applying the law to Durand-Wayland's counterclaim that the invention was "on sale" greater than one year before the patent application was filed. A finding that the invention was "on sale" one year prior to the patent application would preclude a valid patent from issuing under 35 U.S.C. § 102. The district court applied an "on hand" test to determine whether the invention was "on sale" stating that "there was no sorter in existence at that time". However, application of the "on hand test" has been rejected. *See Barmag Barmer Maschinenfabrik AG v. Murata Machinery, Ltd.*, 731 F.2d 831 (Fed. Cir. 1984). The determination of

whether an invention is "on sale" includes consideration of the following:

1. Whether an embodiment that contains all the elements is in existence prior to the critical date.

2. The invention offered for sale has been reduced to practice at the time of the offer for sale.

3. That the offer for sale was for commercial exploitation of the invention rather than for experimental purposes. *See* 731 F.2d at 838.

The statutory "on sale" bar applies when the invention which is the subject matter of a patent application is merely *offered* for sale; there is no requirement that a sale be consummated before the statutory bar attaches. *D.C. Auld Co. v. Chroma Graphics Corp.*, 714 F.2d 1144, 1150 (Fed. Cir. 1983). The fact that the order was not shipped until after the critical date does not avoid the "on sale" bar. *In re Thesis*, 610, F.2d 786, 791 (C.C.P.A. 1979).

It is clear that where "on sale" activities would have undoubtedly barred the issuance of a patent under 35 U.S.C. § 102 (b) those sales activities can alone be an adequate justification for the awarding of attorney's fees under 35 U.S.C. § 285. *See American Can Co. v. Crown Cork & Seal Co., Inc.*, 693 F.2d 653. The memorandum from Mr. Williamson (A-198) clearly evidences an "on sale" date of February 19, 1975 and the filing date of the patent application is February 20, 1976. (A-183). Had the district court correctly applied the law in determining whether there was an "on sale" bar would have affected the lower Court's determination in awarding attorney's fees. Thus, the Appellate Court's determination that the issue of validity is moot is clearly erroneous since it directly affects the award of attorney fees under 35 U.S.C. § 285.

Finally, the district court's opinion fails to address the issue of whether there was inequitable conduct before the Patent and Trademark Office during the prosecution of the patent application. It was shown at trial that Pennwalt committed inequitable conduct before the Patent and Trademark Office by not disclosing material prior art. The inventors for the patent-in-suit owed an "uncompromising duty of candor" to the Patent and Trademark Office to reveal everything which might have any bearing on the granting of any claim in the patent. *Argus Chemical Corp. v. Fiber Glass-Evercoat Co.*, 759 F.2d 10 (Fed. Cir. 1985). The rule enforcing the duty of candor was in force at the time of the finding of the application of the patent-in-suit.

The applicants failed to reveal information known to them prior to the issuance of the '628 patent. The "on sale" activity more than one year prior to the filing of the patent application was not disclosed to the Patent and Trademark Office. Prior art known to the inventor, namely the Sunkist EMG Machine, (A-181, 182) which was partially developed by one of the co-inventors to the patent-in-suit, and Sunkist's work resulting in its Conway patent (A-179) were also not disclosed when filing the patent application. The failure to disclose material "on sale" information constitutes inequitable conduct. *Argus Chemical Corp.*, 759 F.2d at 15. Inequitable conduct is also found for failure to disclose known prior material during the prosecution of a patent application. *See Beckman Instruments, Inc. v. Chemtronics, Inc.*, 428 F.2d 555, 565-66 (5th Cir. 1970). Such conduct justifies an award of attorney's fees under 35 U.S.C. § 285. *Kimberly Clark Corp. v. Johnson & Johnson*, 575 F.Supp 1179 (ND Ill. 1983).

CONCLUSION

In summary, the United States Court of Appeals for the Federal Circuit violated strong public policy favoring the eradication of invalid patents. The Court of Appeals also erred as a matter of law in holding the issue of validity as moot because:

(1) public policy supports adjudication as to validity.

(2) a holding of "on sale" or inequitable conducts affects all of the claims of the patent.

(3) inequitable conduct supports an award of attorney's fees to Cross-Petitioners.

Thus, Cross-Petitioner/Respondent, Durand-Wayland, respectfully requests that the case be remanded to the Court of Appeals for the Federal Circuit for reconsideration of these issues.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I, George M. Hopkins, a member of the Bar of the Supreme Court of the United States and counsel of record for Durand-Wayland, Inc., respondent herein, hereby certify that on _____, 1988, pursuant to Rule 28, Rules of the Supreme Court, I have served three (3) copies of the attached Cross-Petition for a Writ of Certiorari to the United States Court of Appeals for the Federal Circuit to the United States Court of Appeals for the Federal Court on Pennwalt Corporation, Petitioner herein, by depositing such copies of the United States Post Office, Atlanta, Georgia, with first class postage prepaid, properly addressed to the post office address of Joel S. Goldhammer, Esquire, the above- named petitioner's counsel, at Siedel, Gonda, Goldhammer & Abbott, P.C., 1800 Two Penn Center Plaza, Philadelphia, Pennsylvania, 19102.

All parties required to be served have been served.

Dated: _____

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Supreme Court, U.S.
FILED
FEB 24 1988
JOSEPH F. SPANIOL, JR.
CLERK

No. 87-1228

In the Supreme Court

OF THE

United States

OCTOBER TERM, 1987

PENNWALT CORPORATION
Petitioner,
VS.
DURAND-WAYLAND, INC.,
Respondent,
Cross-Petitioner.

APPENDIX I

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United States Court of Appeals for the Federal Circuit

PENNWALT CORPORATION,
Appellant/Cross-Appellee,

v.

Appeal Nos. 85-1882 and 85-1933

DURAND-WAYLAND, INC.,
Appellee/Cross-Appellant.

Joel S. Goldhammer, Seidel, Gonda & Goldhammer, P.C., of Philadelphia, Pennsylvania, argued for appellant/cross-appellee. With him on the brief were *Gregory J. Lavorgna* and *Steven J. Rocci*, of counsel.

George M. Hopkins, Newton, Hopkins & Ormsby, of Atlanta, Georgia, argued for appellee/cross-appellant. With him on the brief was *Todd Deveau*.

Appealed from: U.S. District Court for the Northern District of Georgia

Judge Tidwell

United States Court of Appeals for the Federal Circuit

PENNWALT CORPORATION, Appellant/Cross-Appellee,	)	
v.	)	Appeal Nos. 85-1882 85-1933
DURAND-WAYLAND, INC. Appellee/Cross-Appellant.	)	

DECIDED: November 6, 1987

Before MARKEY, *Chief Judge*, FRIEDMAN, RICH, and DAVIS, *Circuit Judges*, COWEN and BENNETT, *Senior Circuit Judges*, SMITH, NIES, NEWMAN, BISSELL, ARCHER, and MAYER,* *Circuit Judges*.**

BISSELL, *Circuit Judge*, filed an opinion, in which MARKEY, *Chief Judge*, FRIEDMAN, RICH, DAVIS, NIES, and ARCHER, *Circuit Judges*, joined; BENNETT, *Senior Circuit Judge*, filed a dissent-in-part, in which COWEN, *Senior Circuit Judge*, SMITH and NEWMAN, *Circuit Judges*, joined. NIES, *Circuit Judge*, filed additional views; NEWMAN, *Circuit Judge*, filed a commentary.

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* MAYER, *Circuit Judge*, took no part in the consideration or decision of this case.

** This case was argued before a panel consisting of Bennett, *Circuit Judge*, Cowen, *Senior Circuit Judge*, and Nies, *Circuit Judge*, on October 11, 1985. An active judge not on the panel suggested in banc consideration and the court so decides the case. Judge Bennett assumed senior status on March 1, 1986.

BISSELL, *Circuit Judge*.

This appeal and cross-appeal are from a judgment of the United States District Court for the Northern District of Georgia, 225 USPQ 558 (N.D. Ga. 1984). The district court found that Durand-Wayland's accused devices do not infringe any claim, literally or under the doctrine of equivalents. Unable to view that finding as clearly erroneous under Fed. R. Civ. P. 52(a), we affirm the judgment of noninfringement and vacate, as moot, that part of the judgment concerning the validity of Pennwalt's patent.

BACKGROUND

Pennwalt sued Durand-Wayland for infringing claims 1, 2, 10 and 18 (claims-at-issue) of its U.S. Patent No. 4,106,628 (the '628 patent) on an invention of Aaron J. Warkentin and George A. Mills, entitled "Sorter for Fruit and the Like." Following a nonjury trial on the issues of patent infringement and validity, the district court, on March 22, 1984, issued an opinion concluding that (1) the claims-at-issue were not anticipated by the prior art, (2) the '628 patent had not run afoul of the "on sale" bar of 35 U.S.C. §102(b) (1982), and (3) the accused devices did not infringe any of the claims-at-issue, either literally or under the doctrine of equivalents. In an unpublished supplemental order of April 26, 1984, the district court concluded as a matter of law that the claims-at-issue would not have been obvious in light of the prior art.

Pennwalt appeals from the district court's holding of noninfringement, both literally and under the doctrine of equivalents, and its award of costs against Pennwalt. Durand-Wayland appeals from the district court's validity holdings and its denial of Durand-Wayland's request for recovery of its attorney fees.

ISSUE

Our disposition of this appeal requires resolution of the single question of whether the district court's finding of no infringement was clearly erroneous.

OPINION

The '628 patent claims a sorter. The principal object of the invention is to provide a rapid means for sorting items, such as fruit, by color, weight, or a combination of these two characteristics. The sorter recited in claims 1 and 2 conveys items along a track having an electronic-weighing device that produces an electrical signal proportional to the weight of the item, along with signal comparison means, clock means, position indicating means, and discharge means, each of which performs specified functions. The specification describes the details of a "hard-wired" network consisting of discete electrical components which perform each step of the claims, e.g., by comparing the signals from the weighing device to reference signals and sending an appropriate signal at the proper time to discharge the item into the container corresponding to its weight. The combined sorter of claims 10 and 18 is a multifunctional apparatus whereby the item is conveyed across the weighing device and also carried past an optical scanner that produces an electrical signal proportional to the color of the item. The signals from the weighing device and color sensor are combined and an appropriate signal is sent at the proper time to discharge the item into the container corresponding to its color and weight.

Durand-Wayland manufactures and sells two different types of sorting machines. The first accused device, the "Microsizer," sorts by weight only and employs software labeled either Version 2 or Version 3. The second accused device employs software labeled Version 6 and sorts by both color and weight through the use of the "Microsizer" in conjunction with a color detection apparatus called a "Microsorter."

A more complete description of the claimed invention and of the accused devices is set forth in the district court's opinion. *Pennwalt*, 225 USPQ at 559-60. The claims-at-issue are set forth in the district court's opinion. *Id.* at 564-65.

I.

Literal Infringement

Pennwalt asserts on appeal that all limitations set forth in claims 1 and 2 and some limitations set forth in claims 10 and 18 can be read literally on the accused devices. Pennwalt contends that the district court erred in interpreting the claims by going beyond the means-plus-function language of a claim limitation and comparing the structure in the accused devices with the *structure* disclosed in the specification. Such comparison allegedly resulted in the court's reading nonexistent structural limitations into the claims. Pennwalt relies on the statement in *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 607 (1950): "If accused matter falls clearly within the claim, infringement is made out and that is the end of it." In view of the literal breadth of means-plus-function language in the claims, that "test" for literal infringement would encompass *any* means that performed the function of a claim element. 35 U.S.C §112 (1982). This is not the "test." The *Graver Tank* statement predated the inclusion in the 1952 Act of the provision specifically permitting "means" limitations, section 112, paragraph 6. *See* P. Federico, *Commentary on the New Patent Law*, 35 USCA 1, 25 (1954). As Judge Rich, one of the drafters of the statute, stated in a 1952 address explaining the import of section 112, paragraph 6:

> If you adopt this practice, that element or step is to be construed — shall be construed (it is mandatory) — to cover the corresponding structure, material or acts described in the specification and equivalents thereof.

Address before the New York Patent Law Association (November 6, 1952), *reprinted in* R. Calvert, *The Encyclopedia of Patent Practice and Invention Management* 17, "Section 112 — Means Claims" (1964).

Thus, section 112, paragraph 6, rules out the possibility that any and every means which performs the function specified in the claim *literally* satisfies that limitation. While encompassing equivalents of those disclosed in the specification, the provision,

nevertheless, acts as a restriction on the literal satisfaction of a claim limitation. *Data Line Corp. v. Micro Technologies, Inc.*, 813 F.2d 1196, 1201, 1 USPQ2d 2052, 2055 (Fed. Cir. 1987). If the required function is not performed *exactly* in the accused device, it must be borne in mind that section 112, paragraph 6, equivalency is not involved. Section 112, paragraph 6, plays no role in determining whether an equivalent function is performed by the accused device under the doctrine of equivalents.

Thus, it was not legal error (as Pennwalt asserts) for the district court to have made a comparison between Durand-Wayland's structure and the structure disclosed in the specification for performing a particular function. The statute means exactly what it says: To determine whether a claim limitation is met literally, where expressed as a means for performing a stated function, the court must compare the accused structure *with the disclosed structure*, and must find equivalent *structure* as well as *identity* of claimed *function* for that structure. *Palumbo v. Don-Joy Co.*, 762 F.2d 969, 975, 226 USPQ 5, 8 (Fed. Cir. 1985); *D.M.I., Inc. v. Deere & Co.*, 755 F.2d 1570, 1575, 225 USPQ 236, 239 (Fed. Cir. 1985); *Radio Steel & Mfg. Co. v. MTD Prods., Inc.*, 731 F.2d 840, 848, 221 USPQ 657, 663 (Fed. Cir. 1984).

Where the issue is raised, it is part of the ultimate burden of proof of the patent owner to establish, with respect to a claim limitation in means-plus-function form, that the structure in the accused device which performs that function is the same as or an equivalent of the structure disclosed in the specification. In essence, Pennwalt erroneously argues that, if an accused structure performs the function required by the claim, it is per se structurally equivalent. That view entirely eliminates the section 112, paragraph 6, restriction and has been rejected in the above-cited precedent of this court.

We need not, and do not, determine whether the district court correctly found no equivalency in structure because the district court also found that the accused devices, in any event, did not perform the same functions specified in the claim. For example, the district court found that the accused devices had no position indicating means which tracked the location of the

item being sorted. That finding negates the possibility of finding literal infringement.

II

Infringement under the Doctrine of Equivalents

Under the doctrine of equivalents, infringement *may* be found (but not necessarily)[1] if an accused device performs substantially the same overall function or work, in substantially the same way, to obtain substantially the same overall result as the claimed invention. *Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 901-02, 221 USPQ 669, 679 (Fed. Cir.), *cert denied*, 469 U.S. 857 (1984); *Graver Tank*, 339 U.S. at 608. That formulation, however, does not mean one can ignore claim limitations. As this court recently stated in *Perkin-Elmer Corp. v. Westinghouse Elec. Corp.*, 822 F.2d 1528, 3 USPQ2d 1321 (Fed. Cir. 1987):

> One must start with the claim, and though a "non-pioneer" invention may be entitled to some range of equivalents, a court may not, under the guise of applying the doctrine of equivalents, erase a plethora of meaningful structural and functional limitations of the claim on which the public is entitled to rely in avoiding infringement. . . . Though the doctrine of equivalents is designed to do equity, and to relieve an inventor from a semantic strait jacket when equity requires, it is not designed to permit wholesale redrafting of a claim to cover non-equivalent devices, i.e., to permit a claim expansion that would encompass more than an insubstantial change. (Citations omitted.)
>
> . . . [I]n applying the doctrine of equivalents, each limitation must be viewed in the context of the entire claim.

---

1. The doctrine of equivalents is limited in that the doctrine will not extend (1) to cover an accused device in the prior art, and (2) to allow the patentee to recapture through equivalence certain coverage given up during prosecution. *Loctite Corp. v. Ultraseal Ltd.*, 781 F.2d 861, 870, 228 USPQ 90, 96 (Fed. Cir. 1985).

> . . . "It is . . . well settled that each element of a claim is material and essential, and that in order for a court to find infringement, the plaintiff must show the presence of every element or its substantial equivalent in the accused device." *Lemelson v. United States*, 752 F.2d 1538, 1551, 224 USPQ 524, 533 (Fed. Cir. 1985) (footnote omitted). To be a "substantial equivalent," the element substituted in the accused device for the element set forth in the claim must not be such as would substantially change the way in which the function of the claimed invention is performed.

Id. at 1532-33, 3 USPQ2d at 1324-25.

Pennwalt argues that the "accused machines simply do in a computer what the patent *illustrates* doing with hard-wired circuitry," and asserts that "this alone is insufficient to escape infringement," citing *Decca Ltd. v. United States*, 544 F.2d 1070, 1080-81, 191 USPQ 439, 447 (Ct. Cl. 1976). If Pennwalt was correct that the accused devices differ only in substituting a computer for hard-wired circuitry, it might have a stronger position for arguing that the accused devices infringe the claims. The claim limitations, however, require the performance of certain specified functions. Theoretically, a microprocessor could be programmed to perform those functions. However, the district court found that the microprocessor in the accused devices was not so programmed.

After a full trial, the district court made findings that certain functions of the claimed inventions were "missing" from the accused devices and those which were performed were "substantially different." *Pennwalt*, 225 USPQ at 372. The district court observed that "because the 'Microsizer' uses different elements and different operations (on the elements it does use) than the elements and operations disclosed in the patent-in-suit to achieve the desired results, infringement can only be found if the different elements and operations are the legal equivalents of those disclosed in the patent-in-suit." *Id.* It is clear from this that the district court correctly relied on an element-by-element comparison to conclude that there was no infringement under the doctrine of equivalents, because the accused devices did not

perform substantially the same functions as the Pennwalt invention. For example, the district court found in part:

> The machine described in the patent-in-suit uses shift registers that respond to "clock pulses" in order to indicate the various positions of the items to be sorted before each item is discharged. The "Microsizer" does not have any "indicating means" to determine positions of the items to be sorted since the microprocessor stores weight and color data, not the positions of the items to be sorted. After a piece of fruit has been analyzed by the "Microsorter" and while it is in transit from the optical detection means to the weight scale, the color value determined by the "Microsorter" is sorted in a color value queue. A color value queue pointer (which changes in value) points to the location of the data corresponding to the next piece of fruit to reach the weight scale. A weight value queue pointer (which also changes in value) is used to correspond to the number of cups between the weight scale and the drop location. The microprocessor software utilizes a random access memory that stores the digital numbers which resulted from the conversion of the analog signals generated by the "Microsorter" and the weight scale, and the queue pointers (under clock control) point to the memory location that has the data about a piece of fruit. The data is never "shifted" around, but rather is just stored in memory until the software routines call for data to be utilized in subsequent portions of the program(s). Thus, the "Microsizer" has neither a "first position indicating means" nor a "second position indicating means." The machine described in the patent-in-suit produces signals that indicate where the fruit is, i.e. track the progression of each cup. The "Microsizer" does not.

Id. at 569.

Pennwalt argues that the district court erred as a matter of law in interpreting the claims which led to these findings. Pennwalt asserts that the district court looked to the specification and compared the accused devices with the preferred embodiment. As indicated, under the section 112, paragraph 6,

analysis, such comparison was entirely correct, but it is readily apparent that the court did not so limit its infringement analysis. The court also looked for equivalent *functions*.

It is not the province of this court to determine *de novo* what is the preponderance of the evidence underlying the ultimate finding of no infringement or the subsidiary facts supporting that finding. Indeed, Fed. R. Civ. P. 52(a) prohibits our undertaking the role of the fact finder, which is the domain of the trial court. *Anderson v. City of Bessemer City, North Carolina*, 470 U.S. 564, 573-74 (1985); *Graver Tank*, 339 U.S. at 611. As stated in *United States v. United States Gypsum Co.*, 333 U.S. 364, 395 (1948); "A finding is 'clearly erroneous' when, although there is evidence to support it, the reviewing court on the entire evidence is left with the definite and firm conviction that a mdistake has been committed."

Here, if the district court was not clearly erroneous in finding that even a single function required by a claim or an equivalent function is not performed by the Durand-Wayland sorters, the court's finding of no infringement must be upheld. *Perkin-Elmer v. Westinghouse*, 822 F.2d at 1531, 3 USPQ2d at 1323.

Pennwalt asks us to reweigh the testimony, urging that the testimony of the court-appointed expert, Dr. Vacroux, is so strongly supportive of the contrary finding of infringement under the doctrine of equivalents that the district court's finding of no infringement cannot stand. Pennwalt, however, misconstrues the effect of Dr. Vacroux's testimony. Dr. Vacroux was a technical, not a legal, expert. He was not expected to, and did not, analyze infringement under a legal standard. He was not concerned, for example, with the scope of equivalents to which the claims were entitled in view of the prosecution history. In this light, the reports and testimony of Dr. Vacroux fully support the district court's finding of no infringement, rather than Pennwalt's position.

Pennwalt relies on the conclusory statement in Dr. Vacroux's initial written report in which he characterized the accused devices as "functionally equivalent" to the "invention." However, Dr. Vacroux also stated therein that "the new designs

could be totally equivalent to those they replaced, *although the components and methods* used *differed significantly.*" (Emphasis added.) Further, when Dr. Vacroux was called to testify, and, in response to detailed questioning by the court, Dr. Vacroux testified that the accused devices performed "*some*" of the same type of operations but "in a different way" from the claimed invention. Specifically, Dr. Vacroux answered a question by the court as follows:

> Dr. Vacroux: They [the accused and claimed devices] are not equivalent, but functionally the internal operations I would say internally are functionally equivalent because they perform *some of the same type of operations*. They compare, they shift, they add so we do have the same type of functions internally *but done in a different way*. [Emphasis added.]

Dr. Vacroux's statement that the accused devices performed only "some of the same type of operations" supports the court's finding that some were not. It does not conflict with any of his other testimony or with his written report. Thus, on the issue of whether the accused devices performed *each* of the functional limitations of the claim or its equivalent and, thus, operated in substantially the same way, the district court followed its expert precisely. The court cannot be faulted for finding no infringement where the expert's testimony as to facts negates a finding of equivalency under the correct legal standard. *See Perkin-Elmer v. Westinghouse*, 822 F.2d at 1531-32, 3 USPQ2d at 1323-24.

With respect to the scope of equivalent functions, the court correctly limited the claims, based upon review of the prosecution history, stating that "the claims of the patent should be read in light of the careful phraseology [of functions] chosen by the inventors" because "the machine disclosed in the patent-in-suit was carefully described so that it did not read on the prior art." *Pennwalt*, 225 USPQ at 570. As the court correctly noted, the invention was not a pioneer, but an improvement in a crowded art. The claims are "broad" with respect to what type of product can be sorted, i.e., "items" and, thus, sorters of all types of

"items" fall within the relevant prior art. The claims are *narrow*, however, with respect to how the claimed sorter operates. Originally, the claims contained no position indicating means element with its associated functional limitations. The addition of that element was crucial to patentability. A device that does not satisfy this limitation at least equivalently does not function in substantially the same way as the claimed invention. *Perkin-Elmer v. Westinghouse*, 822 F.2d at 1532, 3 USPQ2d at 1324; *Chemical Eng'g Corp. v. Essef Indus., Inc.*, 795 F.2d 1565, 1572-73, 230 USPQ 385, 390-91 (Fed. Cir. 1986).

The trial court found that the accused devices do not have any position indicating means to determine *positions* of the items to be sorted. Specifically with respect to claims 10 and 18, the court correctly held that "the microprocessor stores weight and color data, not the positions of the items to be sorted." *Pennwalt*, 225 USPQ at 569. Since each of the claims-at-issue requires a position indicating means and the same analysis applies to each, we set forth only the relevant language of claim 10:

> *first position indicating means* responsive to a signal from said clock means and said signal from said second comparison means for continuously indicating the position of an item to be sorted while the item is in transit between said optical detection means and said electronic weighing means,
>
> *second position indicating means* responsive to the signal from said clock means, the signal from said first comparison means and said first position indicating means for generating a signal continuously indicative of the position of an item to be sorted after said item has been weighed.

The testimony of Dr. Alford, Durand-Wayland's expert, was that the accused machine had no component which satisfied either of the above limitations defining position indicating means, and Pennwalt has admitted that the accused machines do

not sort by keeping track of the physical location of an item in transit, continuously or otherwise, as required by each of these limitations.

Pennwalt argues that there is a way to find out where an item is physically located on the track in the accused machine. Its witness, Dr. Moore, testified "*you could find* the location of a particular fruit as it moves from the scale to the drop by counting the distance from the stored value for that fruit back to the place the pointer is indicating at the start of the queue." (Emphasis added.) Dr. Alford, Durand-Wayland's expert, admitted this was *possible*. Thus, Pennwalt asserts that the accused devices have "position indicating means."

One need not explain the technology to understand the inadequacy of Dr. Moore's testimony. As Dr. Moore himself indicates, the accused machine simply *does not do* what he explains "could" be done. It is admitted that the physical tracking of fruit is not part of the way in which the Durand-Wayland sorter works, in contrast to the claimed sorter which requires some means for "continuously indicating the position of an item to be sorted." While a microprocessor theoretically could be programmed to perform that function, the evidence led the court to a finding that the Durand-Wayland machines performed a *substantially different* function from that which each of the claims requires.

With respect to the other limitations of claim 10, Pennwalt admits that the asserted "position indicating means" of Durand-Wayland does not meet the limitation that the means must be "responsive to . . . said signal from said second comparison means" because no comparison is made on the Durand-Wayland machine before the discharge point. However, Pennwalt contends that Durand-Wayland "has merely changed the position of an operable element, but the operation and results achieved are the same as those claimed." Pennwalt's analysis is flawed in significant respects.

First, the claim requires that the "position indicating means" must be responsive to certain specified signals. Thus, finding some combination of components in the accused device that might also be *labeled* a "position indicating means" is a

meaningless exercise when such combination is not responsive to the specified signal. *See Polaroid Corp. v. Eastman Kodak Co.*, 789 F.2d 1556, 1570, 229 USPQ 561, 572 (Fed. Cir. 1986) (argument "based on truncation of the claim language" rejected). As stated in *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1576, 1 USPQ2d 1593, 1603, (Fed. Cir.), *cert. denied*, 55 U.S.L.W. 3773 (1987):

> In interpreting the claims, the district court committed fundamental legal error when it analyzed each by a single word description of one part of the claimed tie. In patent law, a word ("teeth"; "hinge"; "ledge") means nothing outside the claim and the description in the specification. A disregard of claim limitations, as here, would render claim examination in the PTO meaningless. If, without basis in the record, courts may so rewrite claims, the entire statutory-regulatory structure that governs the drafting, submission, examination, allowance, and enforceability of claims would crumble.

Second, the district court correctly rejected Pennwalt's assertion that the memory component of the Durand-Wayland sorter which stores information as to weight and color of an item performed substantially the same functions as claimed for the position indicating means. The district court found that a memory function is not the same or substantially the same as the function of "continuously indicating" where an item is physically located in a sorter. On this point the record is indisputable that before the words "continuously indicating" were added as an additional limitation, the claim was unpatentable in view of *prior art* which, like the accused machines, stores the information with respect to sorting criteria in memories, but did not "continuously" track the location. *See. e.g.*, U.S. Patent No. 3,289,832 issued to Ramsey.

Thus, the facts here do not involve later-developed computer technology which should be deemed within the scope of the claims to avoid the pirating of an invention. On the contrary, the inventors could not obtain a patent with claims in which the functions were described more broadly. Having secured claims

only by including very specific *functional* limitations, Pennwalt now seeks to avoid those very limitations under the doctrine of equivalents. This it cannot do. *Graham v. John Deere Co.*, 383 U.S. 1, 33-34 (1965); *Chemical Eng'g Corp.*, 795 F.2d at 1572 n.8, 230 USPQ at 391 n.8; *see also Exhibit Supply Co. v. Ace Patents Corp.*, 315 U.S. 126, 136 (1942); *Coleco Indus., Inc. v. United States Int'l Trade Comm'n*, 573 F.2d 1247, 1257-58, 197 USPQ 472, 479-80 (CCPA 1978). Simply put, the memory components of the Durand-Wayland sorter were not programmed to perform the same or an equivalent function of physically tracking the items to be sorted from the scanner to the scale or from the scale to its appropriate discharge point as required by the claims.[2]

Contrary to Pennwalt's arguments, the district court did not disregard the need to consider a range of equivalent *functions* under the doctrine of equivalents. Rather, upon evaluation of the evidence, the court concluded, as a fact, that no component in the Durand-Wayland devices performed a function within the permissible range of equivalents for the function of the first position indicating means. That function is required by all of the claims-at-issue. No means in the accused devices performs that function and thus there could be no literal infringement. No means with an equivalent function was substituted in the accused devices and thus there can be no infringement under the doctrine of equivalents. The district court's finding of no infringement is not clearly erroneous.

Attorney Fees

Durand-Wayland has not shown that the district court's refusal to find the case exceptional and award it attorney fees was

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2. That a patent applicant narrows his claim to secure a patent does not always mean that prosecution history estoppel completely prohibits the patentee from recapturing some of what was originally claimed. The amount of coverage retained depends on the circumstances of each case. *See, e.g., Loctite Corp. v. Ultraseal Ltd.*, 781 F.2d 861, 870, 228 USPQ 90, 96 (Fed. Cir. 1985); *Bayer Aktiengesellschaft v. Duphar Int'l Research*, 738 F.2d 1237, 1243, 222 USPQ 649, 653 (Fed. Cir. 1984); *Hughes Aircraft Co. v. United States*, 717 F.2d 1351, 1362, 219 USPQ 473, 481 (Fed. Cir. 1983).

based on clearly erroneous findings. *Reactive Metals & Alloys Corp. v. ESM, Inc.*, 769 F.2d 1578, 1582-83, 226 USPQ 821, 824 (Fed. Cir. 1985).

CONCLUSION

We affirm the judgment based on the finding of no infringement, the award of costs, and the denial of attorney fees to Durand-Wayland. There being no indication that Durand-Wayland's cross-appeal on validity extends beyond the litigated claims or the accused devices found to be non-infringing, we dismiss the cross-appeal as moot and vacate that part of the judgment concerning the validity of Pennwalt's patent.

AFFIRMED-IN-PART AND VACATED-IN-PART

United States Court of Appeals for the Federal Circuit

PENNWALT CORPORATION, Appellant/Cross-Appellee,	)	
v.	)	Appeal Nos. 85-1882, 85-1933
DURAND-WAYLAND, INC., Appellee/Cross-Appellant,	)	

BENNETT, *Senior Circuit Judge*, dissenting in part, with whom COWEN, *Senior Circuit Judge*, SMITH and NEWMAN, *Circuit Judges*, join.

I agree with the majority that the district court's finding of no literal infringement of the '628 patent claims has not been shown to be clearly erroneous. However, I believe that the district court failed to consider the doctrine of equivalents issue in accord with the precedents of both this court and the Supreme Court. The in banc majority in this case, in affirming the district court, does not follow the precedents of this court. While the court sitting or hearing a case in banc can overrule its prior decisions, *see Capital Elec. Co. v. United States*, 729 F.2d 743, 746 (Fed. Cir. 1984), it must do so openly and affirmatively, not sub silentio. The majority apparently, curiously, prefers not to acknowledge expressly the significant number of our prior decisions being overruled by its opinion. Therefore, I respectfully dissent from the majority's discussion of and conclusion on the issue of infringement under the doctrine of equivalents.

The majority opinion contravenes Supreme Court precedents, which do not leave the majority free to rewrite the doctrine of equivalents without regard for stare decisis principles. In so doing, the majority has made shortsighted policy choices. The majority has contrived an analytical framework for the doctrine of equivalents that is little more than a redundant literal infringement inquiry, which renders the doctrine of equivalents so unduly restrictive and inflexible as to end its

usefulness as judicial doctrine. As this court is confronted in the future with different factual settings in the varied and increasingly complex technologies that comprise this court's patent cases, the court will be forced to admit (or ignore) the full extent of the ties with which it has bound itself today.

The majority facially retains the historical test set forth in *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 85 USPQ 328 (1950), for infringement under the doctrine of equivalents by stating that infringement in such instances may be found if an accused device performs substantially the same overall function or work, in substantially the same way, to obtain substantially the same overall result as the claimed invention.[1] *Graver Tank*, 339 U.S. at 608, 85 USPQ at 330. But in practical effect, the majority has eviscerated the underlying rationale of the *Graver Tank* test by requiring, under the doctrine of equivalents, an exact equivalent for each element of the claimed invention. The majority in fact commends the district court for undertaking the proper doctrine of equivalents determination, which the majority describes as an element-by-element comparison of the accused device and the patent-in-suit. However, the purported "element-by-element comparison" was never the extent of the doctrine of equivalents analysis under our here-ignored precedents which also required that the analysis be undertaken in light of the entirety of the accused device and entirety of the patent-in-suit. *See, e.g., Martin v. Barber*, 755 F.2d 1564, 1568, 225 USPQ 233, 235 (Fed. Cir. 1985); *Carman Indus., Inc. v. Wahl*, 724 F.2d 932, 942, 220 USPQ 481, 488-89 (Fed. Cir. 1983); *Hughes Aircraft Co. v. United States*, 717 F.2d 1351, 219 USPQ 473 (Fed. Cir. 1983).

Even the district court in this case recognized that our precedents require more. Unlike the limited analysis attributed

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1. The Supreme Court in *Graver Tank* recognized that infringement under the doctrine of equivalents is "ready and available for utilization when the proper circumstances for its application arise." 339 U.S. at 608, 85 USPQ at 330. However, when the basic test is invoked and the proper circumstances proven by a patentee, a finding of infringement is not discretionary. *Cf.* Harris, *Ambiguities of the Doctrine of Equivalents in the Federal Circuit*, 69 J. Pat. & Trademark Off. Soc'y 91, 92 n.4 (1987).

to it by the majority, once the district court determined that all the elements in the patent-in-suit or equivalents of those elements (as determined under 35 U.S.C. §112-6) were not present in the accused device, it attempted to go beyond the element-by-element comparison to determine whether the "different elements and operations" used in the accused device were "the legal equivalents of those disclosed in the patent-in-suit."[2] 225 USPQ at 572. Although in my opinion the district court did not completely understand the significance of the requirement to view the "claimed invention as a whole" and therefore erred in making the proper inquiry, the district court nevertheless was attempting to comply with our precedents that undeniably required application of the doctrine of equivalents to the invention as a whole. *Hughes*, 717 F.2d at 1364, 219 USPQ at 482. This required the fact finder to decide by viewing the accused device as a whole whether it and the claimed invention operate in substantially the same way and have substantially the same function and result as the claimed invention. *Martin*, 755 F.2d at 1568, 225 USPQ at 235.[3]

The majority's departure from our recent precedents is illustrated by an examination of *Hughes Aircraft Co. v. United States*, 717 F.2d 1351, 219 USPQ 473 (Fed. Cir. 1983), which is clearly being overruled by the majority, despite not even being mentioned in its opinion. In *Hughes*, this court squarely addressed the issue of infringement under the doctrine of equivalents of claims containing means-plus-function limitations. The invention in *Hughes* was an "apparatus" (a space satellite) and

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2. Surprisingly, this is the exact sentence from the district court's opinion which the majority quotes to illustrate the district court's purported adherence to an element-by-element analysis. If the analysis announced by the majority here had been followed by the district court, the district court would not have needed to go beyond its determination that the accused device employed different elements and different operations on those different elements in order to support its finding of no infringement.

3. Here, there is no dispute that the two devices at issue perform the same overall function and achieve the same overall result. Thus, the relevant inquiry, as it is in nearly all doctrine of equivalents analyses, is whether the accused device and the claimed invention perform the same overall function to achieve the same overall result *in substantially the same way*.

the representative claim contained multiple limitations, some of which were written in means-plus-function form, including (1) means for providing an indication of the spin angle to a location *external* to the satellite; (2) means for receiving control signals from the *external* source; and (3) means for applying fluid to a fluid expulsion means within a fixed time period after the receipt of a control signal *from the external location*. *Id.* at 1364, 219 USPQ at 483. The alleged infringing spacecraft replaced the three above-enumerated steps with an on-board computer which did not transmit the data to an external source, receive a control signal from that external source, or respond to the received signal as expressly required by the claim limitations.

The *Hughes* trial court had treated the subject of equivalency in its finding:

> There is no obvious or exact equivalent of plaintiff's means for providing an indication of the ISA to an external location in either of the SKYNET II, NATO II or DSCS II systems. Nor is there an obvious or exact equivalent of the means for pulsing the precession jet within a fixed time period after the receipt of a control signal in any of the accused store and execute systems.

Id. at 1363, 219 USPQ at 482 (quoting district court option). This court, in reversing the trial judge, concluded that:

> However the phrase "obvious and exact equivalents" may be defined, it was effectively and improperly applied here as a substitute for literal infringement, the absence of which was conceded. *The failure to apply the doctrine of equivalents to the claimed invention as a whole, and the accompanying demand for "obvious and exact" equivalents of two elements the presence of which would have effectively produced literal infringement, was error.*

Id. at 1364, 219 USPQ at 482 (emphasis added).

The *Hughes* decision held that the accused spacecraft with the position computed and retained on-board was the equivalent of the claimed satellite with its position calculated on the ground since the devices performed substantially the same function in

substantially the same way to reach the same result, and that this conclusion was not estopped by the prior art or prosecution history. This conclusion was reached in full recognition of the failure of the accused spacecraft to meet separately three limitations of the claims-in-issue. *Hughes* stated:

> That argument is clearly effective against an allegation of literal infringement, for if the . . . spacecraft *did* send an ISA position to the ground, literal infringement of that element of the claims would be clear. Williams controls his satellite, and the government controls its S/E spacecraft, from the ground. That Williams does so in "real time" and the government does so in a delayed reaction made possible by the advent of computers does not establish that the S/E spacecraft do not perform the same function in substantially the same way to obtain the same result.

Id. at 1365, 219 USPQ at 483 (emphasis in original).[4]

Despite any protestations to the contrary, it should be beyond dispute that infringement could not have been found in *Hughes* under the analysis announced by the majority today. In fact, the majority's current analysis under the doctrine of equivalents amounts to nothing more than the search for "obvious and exact equivalents" that this court denounced in *Hughes*. This is aptly illustrated by the majority's reliance on the Durand microprocessor not being programmed to perform each of the functions required by the claim limitations, even though it was theoretically possible to so program the microprocessor,

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4. Relying on three cases from the Court of Claims, *Hughes* made clear that "partial variation in technique, an embellishment made possible by [post-patent] technology, does not allow the accused spacecraft to escape the 'web of infringement.' " *Id.* at 1365, 219 USPQ at 483 (citations omitted). However, in this case, both Pennwalt and Durand agreed that microprocessor technology existed at the time of the February 1976 application for the '628 patent, although those available were considerably less powerful and more costly than those available around 1980. 225 USPQ at 370. It is clear that an equivalent can be found in technology known at the time of the invention, as well as in subsquently developed technology. *See, e.g., Atlas Powder Co. v. E.I. Du Pont De Nemours & Co.*, 750 F.2d 1569, 1581, 224 USPQ 409, 417 (Fed. Cir. 1984).

as grounds for affirmance of the finding of no infringement under the doctrine of equivalents.

Although the majority asserts Pennwalt's case might be stronger if the accused devices only substituted a computer for hard-wired circuitry, the district court found that "the machine described in the patent-in-suit and the 'Microsizer' are virtually identical *except* for the control system that conducts the sorting operation." 225 USPQ at 569 (emphasis in original). The majority does not criticize that finding. Furthermore, the district court's finding that the Microsizer performed different functions than the patent-in-suit was solely part of the district court's analysis leading to its finding that there was no literal infringement, *id.*, and can be characterized as nothing more than a recognition of the inherent differences in hard-wired circuitry and microprocessors. If, as under the district court's and the majority's analyses, the use of software and a computer or microprocessor to perform the function of hard-wired circuitry is enough to find that a device employing a microprocessor performs different functions and operations, then no device that employs computers or microprocessors could even under the doctrine of equivalents infringe a prior patent on a device that employs hard-wired circuitry. The extent of the doctrine of equivalents inquiry cannot be confined, as it was by the district court and the majority, to the mere change to the use of a computer or microprocessor.

As stated by the Supreme Court in *Graver Tank*, 339 U.S. at 609, 85 USPQ at 331, it is important to know whether those "reasonably skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was," *see infra*, but the district court added an erroneous criterion: whether those with ordinary skill in the art would know *how* to substitute them. *Pennwalt*, 225 USPQ at 572. In my opinion, the district court misconstrued the inquiry. If the inquiry is to determine whether one item can be substituted for another, and those skilled in the art know that it can, then the actual interchangeability of the two items is not affected by whether those same persons could, without further study, substitute them. *See Atlas Powder Co. v. E.I. Du Pont*

De Nemours & Co., 750 F.2d 1569, 1580, 224 USPQ 409, 416-17 (Fed. Cir. 1984); *Lockheed Aircraft Corp. v. United States*, 553 F.2d 69, 82, 193 USPQ 449, 461 (Ct. Cl. 1977).[5]

The literal infringement inquiry involving section 112-6 and the infringement inquiry under the doctrine of equivalents are distinct, even when limitations written in means-plus-function language are present, and must be made separately when, as in the present case, each is properly at issue. The majority apparently agrees that the two infringement analyses should be distinct, but nevertheless completely blurs, if not eliminates, the distinctions between them. For, if section 112-6 "plays no role in determining whether an equivalent function is performed by the accused device under the doctrine of equivalents," it is curious that the majority relies on a lengthy quote from the district court's discussion of why the accused device does not literally infringe the patent-in-suit to illustrate why the district court's element-by-element literal infringement comparison yielded no equivalent for the position indicating means.

Thus, while the majority's subsequent discussion does indeed support its conclusion that the district court's finding of no literal infringement was correct, it is completely inappropriate as part of the infringement analysis under the doctrine of equivalents. The enactment of section 112-6 did not eliminate the applicability of the doctrine of equivalents in situations

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5. This distinction strikes me as being especially important where computers and/or multidiscipline inventions are involved. *Cf. In re Naquin*, 398 F.2d 863, 866, 158 USPQ 317, 319 (CCPA 1968) (specification is enabling when it allows the adepts of each art involved in the invention to carry out the aspect proper to their specialty). The court's new standard improperly requires the person of average skill in the art not only to have the knowledge that microprocessors could be interchanged with the electronics of the hard-wired sorting machines, but also to know *how* the computer's components and logic actually work and function and *how* to substitute them. Such a general rule is inappropriate to a doctrine of equivalents analysis, which requires sufficient flexibility to consider the extent and complexity of the modification, in order to reach a just result on the facts of each case and to avoid "a fraud on [the] patent." *See Graver Tank*, 339 U.S. at 608, 85 USPQ at 330.

where there are means-plus-function claims involved. The majority nevertheless abandons the additional and separate equivalence analysis heretofore necessary, and fails to require the district court properly to determine if the accused device contained an equivalent of the position indicating means under the doctrine of equivalents, after having viewed the claimed invention and the accused device as a whole.

Furthermore, the court-appointed expert's testimony does not support either the majority's conclusions or its analysis. In fact, the majority should have declined the invitation to reweigh the testimony and certainly should not have taken the additional step of recasting the court-appointed expert's testimony to support its position since the job of evaluating the testimony of expert witnesses in general is peculiarly that of the trier of fact. *See, e.g., Inwood Labs., Inc. v. Ives Lab., Inc.*, 456 U.S. 844, 856 (1982); *Gould v. Quigg*, 822 F.2d 1074, 1077-78, 3 USPQ2d 1302, 1304 (Fed. Cir. 1987). The district court described Dr. Vacroux's testimony as "unbiased, well-qualified and scholarly," but nevertheless declined to adopt it. 225 USPQ at 372. As the majority points out, Dr. Vacroux was a technical, not legal, expert and he did not analyze the infringement issue under a legal standard. Yet, despite the district court's rejection of testimony which was not directed toward the legal issues in the case, the majority curiously determines that the same testimony fully supports its finding of no infringement. Thus, it would appear that the district court was operating under a different view of what was needed for infringement under the doctrine and that the expert's testimony must not have supported a finding of noninfringement under what the district court perceived the legal standard to be prior to this decision. Since Dr. Vacroux's testimony was, at best, adequate to support a finding of no literal infringement, but completely inconclusive on the issue of infringement under the doctrine of equivalents, I prefer the district court's decision not to adopt Dr. Vacroux's testimony to the majority's decision to recast it.

The majority goes on to conclude that Pennwalt is estopped by the prosecution history from gaining coverage under the

doctrine of equivalents of that which it gave up through amendment of its claims during prosecution of the '628 patent. First, the majority holds that since the original claims were unpatentable without the "position indicating means" element, Pennwalt cannot now argue that "crucial" element is immaterial or deny that a device without that element does not function in substantially the same way as the claimed invention. However, in my view, the amendment to include the term "position indicating means" does not end the infringement inquiry here since both the accused device and the claimed invention "indicate position" in equivalent manners. The majority errs in interpreting the actual meaning of the term, as used by the patentee.

The district court held that "the microprocessor stores weight and color data, not the position of the items to be sorted." 225 USPQ at 569. The majority upholds this finding as not clearly erroneous and, to the limited extent of the finding, I agree. However, the conclusion that the accused device does not indicate position does not end the analysis because it is clear that the claimed invention, just like the accused device, does not store or directly indicate the position of the items to be sorted. In order to apply the claims, they must first "be construed 'in connection with the other parts of the patent instrument and with the circumstances surrounding the inception of the patent application.' " *Fromson v. Advance Offset Plate, Inc.*, 720 F.2d 1565, 1569, 219 USPQ 1137, 1140 (Fed. Cir. 1983) (quoting *Autogiro Co. v. United States*, 384 F.2d 391, 397, 155 USPQ 697, 702 (Ct. Cl. 1967)).

The claimed invention of the '628 patent employs shift registers to shift sequentially weight and color data corresponding to a specific item from one memory register to an adjoining register as that item moves along the conveyor belt. The data is placed and shifted across shift registers containing the same number of registers as there are conveyor locations between one detection means (for weight or color) and either the next detection means or the discharge point. Thus, the shifted data in the claimed invention represents weight and color data, not position, and could only be used to indicate position in the literal sense by physically counting where in the shift register is the

data for a given item. Just as in the accused device, although it could be done, it is not.

Both devices do, however, continually store the data corresponding to a particular item until it has reached the proper drop location corresponding to its color and weight characteristics. The claimed invention does this through the use of shift registers as described above while the accused device stores the data in a queue and uses pointers which move synchronously with the movement of the conveyor cups. The real question to be answered here, one which the district court and the majority never reached, is whether the queues and pointers perform in substantially the same way the functions of the claimed position indicating means when the latter are interpreted in light of the specification. The majority also holds that since Pennwalt added the limitation "continuously indicating" to the claims containing the position indicating means element, it cannot use the doctrine of equivalents to avoid that limitation. But whether the patent claims were amended by adding "continuously indicating" in order to distinguish from the noncontinuous methods employed in prior art, such as the Ramsey patent, is not relevant here since the Durand device also performs continuously the "position indicating" function.

Finally, the majority's treatment of the limitation that the first position indicating means be "responsive to . . . said signal from said second comparison means" is the clearest illustration of the shortcomings of the majority's approach to the doctrine of equivalents. Pennwalt concedes that the Durand devices do not literally infringe claims 10 and 18 because that limitation is not literally met. In the claimed invention, the color grade from the color head is compared to the reference values and converted into data form, which then is stored directly in the first position indicating means while the item is in transit to the weight scale. In the Durand device, the color grade is stored directly and is not compared to the reference values until the item had reached the weight scale.

The majority rejected as significantly flawed Pennwalt's assertion that Durand's mere change of the position of an operable element was not enough to avoid infringement under

the doctrine of equivalents. However, the only apparent flaw noted by the majority is that the claim requires that the position indicating means be responsive to certain signals and that without being responsive to the specified signal, any other combination of elements cannot be deemed to contain an equivalent of the functional limitations describing the position indicating means. In my view, a comparison to the color reference values occurring in the Durand device after the item reaches the weight scale is an equivalent function whether or not its first position indicating means is responsive to a signal from a comparison means, when the accused device is viewed in its entirety and compared to the claimed invention as a whole. To preclude the possibility of finding equivalent functions and therefore preclude finding infringement under the doctrine of equivalents simply because the accused device does not perform its functions in the same order as the claimed invention reduces the doctrine of equivalents, in practical effect, to nothing more than the test for literal infringement.

As discussed above, the majority is overruling this court's recent teachings that require consideration of the claimed invention as a whole when making the doctrine of equivalents analysis. The overruling of our precedents is, of course, permissible since the court sua sponte sits in banc. However, even when sitting in banc, this court can only overrule its own prior decisions, not those of the Supreme Court. I believe that the majority's opinion departs significantly from the clear teachings of the Supreme Court, specifically those in *Graver Tank & Mfg. Co. v. Linde Air prods. Co.*, 339 U.S. 605, 85 USPQ 328 (1950), and; in fact, adopts the position and the spirit of the dissenting opinions rejected in *Graver Tank*.

In *Graver Tank*, the patent claims at issue involved an electrical welding process containing a combination of an alkaline earth metal silicate and any other silicate. The patented composition actually used silicates of calcium and magnesium, which were both alkaline earth metal silicates. The accused composition used silicates of calcium and manganese, the latter not being an alkaline earth metal. That difference prevented the finding of literal infringement. Nevertheless, the Supreme

Court noted that the two compositions used the same mechanical methods, were identical in operation, and produced the same kind and quality of weld.

The key issue became whether the substitution of a non-alkaline earth metal (manganese) for the alkaline earth metal (magnesium) claimed in the patent was, under the circumstances of the case and in view of the prior art and the technology involved, a sufficiently insubstantial change which justified application of the doctrine of equivalents. The Supreme Court concluded, despite the claim language, that the use of manganese was an insubstantial change. In fact, the Court found infringement under the doctrine of equivalents despite several prior art patents which disclosed the use of manganese in welding fluxes, and despite the patent specification itself indicating that the patentee had experimented with using manganese in its fluxes.

The current case presents, as did *Graver Tank* and as does any case involving the doctrine of equivalents, a choice between conflicting policies. On the one hand, there is the historic right of affording the public fair notice of what the patentee regards as his claimed invention in order to allow competitors to avoid actions which infringe the patent and to permit "designing around" the patent. *See, e.g., State Indus., Inc. v. A.O. Smith Corp.*, 751 F.2d 1226, 1236, 224 USPQ 418, 424 (Fed. Cir. 1985). On the other hand, equally important to the statutory purpose of encouraging progress in the useful arts, is the policy of affording the patent owner complete and fair protection of what was invented.

The resulting tension between the competing policies has been long recognized and the inability to reconcile fully the two views has long been accepted by the courts. In *Royal Typewriter Co. v. Remington Rand, Inc.*, 168 F.2d 691,692, 77 USPQ 517, 518 (2d Cir. 1948), Judge Learned Hand elaborated:

> [A] patent is like any other legal instrument; but it is peculiar in this, that after all aids to interpretation have been exhausted, and the scope of the claims has been enlarged as far as the words can be stretched, on proper

> occasions courts make them cover more than their meaning will bear. If they applied the law with inexorable rigidity, they would never do this . . . . [But] at times they resort to the "doctrine of equivalents" to temper unsparing logic and prevent an infringer from stealing the benefit of the invention. No doubt, this is, strictly speaking an anomaly; but it is one which courts have frankly faced and accepted almost from the beginning (footnote omitted). All patents are entitled to its benefit to an extent, measured on the one hand by their contribution to the art, and on the other by the degree to which it is necessary to depart from the meaning to reach a just result.[6]

The same principles were stated by this court in *Thomas & Betts Corp. v. Litton Sys., Inc.*, 720 F.2d 1572, 1579, 220 USPQ 1, 6 (Fed. Cir. 1983):

> If a patentee were bound by the literal language of his specification and claims, the purpose of the doctrine of equivalents, to give relief against the copier who merely makes insubstantial substitutions in a claimed invention, would be frustrated. Thus, the proposition that the claims, taken in view of the specification, measure the metes and bounds of the invention has been realistically tempered by the judicially-formulated doctrine of equivalents.[7]

The equitable doctrine of equivalents has existed since *Winans v. Denmead*, 56 U.S. (15 How.) 330 (1853), and "has been consistently applied by [the Supreme Court] and the lower federal courts . . . when the proper circumstances for its application arise." *Graver Tank*, 339 U.S. at 608, 85 USPQ at 330. In these more than 130 years of jurisprudence there have

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6. Judge Hand's observations and his actual language regarding the tempering of unsparing logic to prevent an infringer from stealing the benefit of an invention were later adopted by the Supreme Court in *Graver Tank*, 339 U.S. at 608, 85 USPQ at 330.

7. *See also* 4 D. Chisum, *Patents* § 18.04[1], at 18-32.3 ("While contrary to the general principle that the claims measure the scope of the patent monopoly, the doctrine is retained in order to prevent persons from practicing fraud on patents.").

indeed arisen instances of judicial interpretation of claims beyond their literal boundaries, in the interest of justice. The view that such judicial flexibility should not exist is contrary to these decades of decisions, and appears to be contrary to that good judgment which underlies our precedents.

To preserve to the district courts the ability to apply the long-standing equitable doctrine of equivalents in infringement suits that merit such equity does not pose a threat to the statutory role of claims.[8] Even when the doctrine of equivalents is invoked, the claims set forth that against which the equivalency is tested. To require a one-to-one correspondence creates a bright line rule easier to apply, but costly in terms of unfair results in exceptional cases. Such inequity has been rejected by ther Supreme Court and, upm until today, by our own precedents. The slight gain in predictability resulting from the majority's opinion will be greatly outweighed by the loss resulting from the inability to remedy inequities resulting from insubstantial changes to and substitutions in patent claims, as the Court recognized in *Graver Tank*.

Had the majority in this case been confronted with the facts of *Graver Tank*, it is doubtful that it would have ever looked beyond the claim limitation specifically requiring an alkaline earth metal. Yet the Court's discussion and analysis in *Graver Tank* illustrates both the shortsightedness of the policy choices

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8. *See Graver Tank*, 339 U.S. at 607, 85 USPQ at 330 ("In determining whether an accused device or composition infringes a valid patent, resort must be had *in the first instance* to the words of the claim." (Emphasis added.)). *Compare Paper Converting Machine Co. v. Magna-Graphics Corp.*, 745 F. 2d 11, 19, 223 USPQ 591, 596 (Fed. Cir. 1984), where this court stated the following:

> [That] argument is based on the utopian belief that a copier "should be able to look to the patent claims and know whether his [or her] activity infringes or not. Although this may be a desirable goal for the patent laws, it is *not* the law as it exists. In particular, the doctrine of equivalents has been judicially created to ensure that a patentee can receive full protection for his or her patented ideas by making it difficult for a copier to maneuver around a patent's claims. In view of this doctrine, a copier never knows whether his product "infringes" a patent or not until a district court passes on the issue. (Emphasis in original.)

and the shortcomings in the analysis adopted by this majority in the current opinion.

> [C]ourts have also recognized that to permit imitation of a patented invention which does not copy every literal detail would be to convert the protection of the patent grant into a hollow and useless thing. Such a limitation would leave room for—indeed encourage—the unscrupulous copyist to make unimportant and insubstantial changes and substitutions in the patent which, though adding nothing, would be enough to take the copied matter outside the claim, and hence outside the reach of law. . . . Outright and forthright duplication is a dull and very rare type of infringement. To prohibit no other would place the inventor at the mercy of verbalism and would be subordinating substance to form. It would deprive him of the benefit of his invention and would foster concealment rather than disclosure of inventions, which is one of the primary purposes of the patent system.
>
> The doctrine of equivalents evolved in respone to this experience. The essence of the doctrine is that one may not practice a fraud on a patent.

339 U.S. at 607-08, 85 USPQ at 330.

Literal differences between the claimed and accused devices should always exist before the issue of infringement under the doctrine is reached. The majority's holding in this case that the making of the color grade comparisons after the item reaches the weight scale in the Durand device is enough to avoid infringement under the doctrine is nothing more than a conclusion that "any unimportant and insubstantial changes and substitutions" which take the accused device "outside the claim" are also sufficient to show that the accused device does not function in substantially the same way as the claimed invention. Thus, the same features which defeat the possibility of literal infringement are now being used to preclude possible application of the doctrine of equivalents. Up until now, this court has rejected such a limited view of the doctrine. *See, e.g., Loctite Corp. v.*

Ultraseal Ltd., 781 F.2d 861, 228 USPQ 90 (Fed. Cir. 1985)[9] Furthermore, the Supreme Court made clear that the doctrine of equivalents was not to be so limited.

> Equivalence, in the patent law, is not the prisoner of a formula and is not an absolute to be considered in a vacuum. It does not require complete identity for every purpose and in every respect. In determining equivalents, things equal to the same thing may not be equal to each other and, by the same token, things for most purposes different may sometimes be equivalents. Consideration must be given to the purpose for which an ingredient is used in a patent, the qualities it has when combined with the other ingredients, and the function which it is intended to perform.

Graver Tank, 339 U.S. at 609, 85 USPQ at 330-31.

The application of the doctrine of equivalents to "the claimed invention as a whole" as expressed by this court in *Hughes*, 717 F.2d at 1364, 219 USPQ at 482, is inherent in the

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9. The accused composition and the claims in *Loctite* were found to differ only in that the claimed composition could cure anaerobically at room temperature, whereas the accused composition cured anaerobically only after the addition of heat at 90° C. The district court concluded this difference required a finding that the compositions did not work in substantially the same way. The district court's approach was held to be incorrect as a matter of law. Although in *Loctite* only a single claim limitation was affected, the statement of law by *Loctite* retains its applicability in the present case. The court stated:

> That finding [that the difference required a conclusion that the compositions do not work in substantially the same way] however, would allow the difference itself to dictate a finding of no equivalence, and if that were the law, one could never have infringement by equivalence. The analysis must go further, and the question the district court should consider on remand is this: given the difference, would the accused composition at 90° C. and the claimed invention at room temperature perform substantially the same function (*e.g.*, filling the pores of the treated material with solid material) in substantially the same way (*e.g.*, by rapidly curing in the absence but not in the presence of oxygen) to give substantially the same result (*e.g.*, a filled material).

Id. at 870, 228 USPQ at 95-96.

policy expressed in *Graver Tank*. In order to determine equivalency in light of "the purpose for which an ingredient is used in a patent" and "the qualities it has when combined with the other ingredients" as mandated by the Supreme Court, it is indeed necessary to view the entire claim as a whole, and not merely to conduct an element by element comparison. It is only after such an analysis that the fact finder can determine, in light of the entire claim and all of its limitations, whether the changes or substitutions made alter substantially the way that the accused device works when compared to the claimed invention as a whole.

Thus, the proper inquiry was and should remain whether the devices considered *as a whole* satisfy the tripartite test of *Graver Tank*. That question has yet to be properly and completely considered by the trial court in this case. I would vacate the district court's decision of noninfringement under the doctrine of equivalents, and remand for a proper consideration of that question in light of the law set out in our prior precedents and this opinion. The question of infringement, whether literal or by equivalents, is a question of fact. *SRI Int'l v. Matsushita Elec. Corp.*, 775 F.2d 1107, 1125, 227 USPQ 577, 589 (Fed. Cir. 1985). It is a question for the district court to decide while properly applying the applicable law. Because the district court's factual findings were made under a misapplication of the law of the doctrine of equivalents, remand for completion of the fact-findings relating to the issue of infringement under the doctrine is the only proper course of action. *See, e.g., Pullman-Standard v. Swint*, 456 U.S. 273, 287 (1982) (findings resting on an erroneous view of the law may be set aside on that basis).

CONCLUSION

Justice in the administration of the patent law recognizes the tension between the statutory role of claims and the equitable doctrine of equivalents. Both the public interest and that of the inventors are best served when an equitable balance is struck, not as a matter of dominating policy, but as the facts require. In my view, the majority's adoption of a rigid element-by-element analysis for the doctrine of equivalents skews the balance well toward a slavish and formalistic adherence to the words of a claim to the detriment of both the patent owner and the public. Furthermore, the majority fails to acknowledge its departure from our precedents which require application of the doctrine of equivalents to the claimed invention as a whole, and the corresponding shift in its application of the doctrine of equivalents. If the failure to mention our contrary precedents was meant to signify the majority's view that no such departure or shift was intended, then I protest the ad hoc method of decision making employed by the majority. While infringement under the doctrine of equivalents is a factual decision to be decided under the facts and circumstances of each case, the parameters and boundaries of the doctrine can only be shaped and identified from examination and study of the prior decisions of the Supreme Court and this court in their varied factual settings. Ignorance of those prior decisions does not foster accomplishment of this court's mission of providing stability to the patent law.

Under the facts and circumstances of this case, I do not believe that Pennwalt is estopped by the addition of position indicating means to its claims during prosecution or by the addition of the limitation that such means indicate "continuously" the position of the item to be sorted. Nor do I believe that an alteration of the order in which certain functions are performed should automatically preclude application of the doctrine of equivalents. In short, I believe that, despite making a laudable effort to handle a developing area of the law, the district court made an abbreviated and incomplete analysis of the doctrine of equivalents issue and must therefore be given

the opportunity to complete its analysis. Therefore, for all of the above reasons, I dissent from the majority's analysis and conclusion on the doctrine of equivalents issue. I would remand the infringement issue to the district court.[10]

10. Ordinarily, a remand on the issue of infringement would require this court to resolve the issues concerning validity raised on appeal. In light of the finding of no infringement by the majority and in view of the varied and potentially complex issues raised by the parties regarding validity, I also express no opinion on any of the validity issues. *Vieau v. Japax, Inc.*, 823 F.2d 1510, 1517-21, 3 USPQ2d 1094, 1100-03 (Fed. Cir. 1987) (Bennett, S.J., concurring). I concur in the affirmance of the denial of attorney fees to Durand-Wayland.

United States Court of Appeals for the Federal Circuit

PENNWALT CORPORATION, Appellant/Cross-Appellee,	)	
v.	)	Appeal Nos. 85-1882 and 85-1933
DURAND-WAYLAND, INC., Appellee/Cross-Appellant.	)	

NIES, *Circuit Judge*, additional views.

No precedent is overruled or even modified by the majority opinion. I join the majority opinion in all respects and write only to add a review of that precedent.

It is axiomatic under our precedent that one cannot obtain patent protection for an inventive concept or for the heart or "essence" of an invention or for an achieved result. That basic principle cannot be avoided under the rubric of "protection of the invention as a whole." The statute requires that the inventor particularly point out and distinctly claim the subject matter of this invention. 35 U.S.C. §112, second paragraph (112-2) (1982). A patent claim is not intended to be and cannot be only a general suggestion of an invention. The invention is defined by the limitations set out in the claim which thereby fix the scope of protection to which the patentee is entitled. The limitations defining the invention tell the public what it cannot make, use, or sell. Equally important, the limitations defining the invention tell the public what it can make, use, or sell without violating the patentee's rights.

The purpose of a claim has not changed since it was stated in *White* v. *Dunbar*, 119 U.S. 47, 52 (1886), as follows:

> The claim is a statutory requirement, prescribed for the very purpose of making the patentee define precisely what his invention is; and it is unjust to the public, as well as an

evasion of the law, to construe it in a manner different from the plain import of its terms.

It is also axiomatic that infringement requires that the claim "read on" the accused device. The means that the patent owner must show structure in the accused device that satisfies the limitations chosen by the inventor to define his invention. An infringement analysis, thus, requires that the courts look at *each* element of the claim, that is, proceed through the claim element-by-element, and look for correspondence in the allegedly infringing device.[1] If an accused device does not contain at least an equivalent for each limitation of the claim there is no infringement because a required part of the claimed invention is *missing*. Indeed, this hoary principle has long been known as the "All Elements" rule. As stated in 4 D. Chisum, *Patents* §18.03[4] (1986):

> **[4]—The "All Elements" Rule**
>
> Claims in patents are typically drafted in the form of a preamble, transition and one or more elements. Each element constitutes a limitation or narrowing of the scope of the claim. It follows that a claim will not cover or "read on" any device or process unless that device or process contains all the elements of the claim (or an equivalent thereof within the meaning of the doctrine of equivalents). [Footnotes omitted.]

Thus, when an element is entirely *missing*, that is, when the accused device does not contain either the exact element of the claim *or* its equivalent, there is no infringement. Conversely, an element is not "missing" if an equivalent has been substituted.

Every Supreme Court decision which has addressed the issue of infringement of a patent claim, beginning with *Prouty* v. *Draper*, 41 U.S. (16 Pet.) 335 (1842) — and the precedent is voluminous — has held that where a part of the claimed

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1. One-to-one correspondence is not required. Elements may be combined in some instances to achieve an equivalent element. *Machine Co.* v. *Murphy*, 97 U.S. 120, 123 (1877).

invention, that is, a limitation of the claim, is lacking in the accused device exactly or equivalently, there is no infringement.

In *Prouty* the Supreme Court explained:

> The patent is for a combination, and the improvement consists in arranging different portions of the plough . . . . [T]his combination, composed of all the parts mentioned in the specification, and arranged with reference to each other, and to other parts of the plough, in the manner therein described, is stated to be the improvement, and is the thing patented. The use of any two of these parts only, or of two combined with a third, which is substantially different, in form, or in the manner of its arrangement and connection with the others, is, therefore, not the thing patented.

41 U.S. at 341. To the same effect are:

Brooks v. *Fiske*, 56 U.S. (15 How.) 211, 219 (1853): "To infringe, Norcross must use all the parts of Woodworth's combination."

Vance v. *Campbell*, 66 U.S. (1 Black) 427, 429 (1861): "[U]nless the combination is maintained, the whole of the invention fails. The combination is an entirety; of one of the elements is given up, the thing claimed disappears."

Eames v. *Godfrey*, 68 U.S. (1 Wall.) 78, 79 (1864):

> The law is well settled by repeated adjudications in this court and the Circuit Courts of the United States, that there is no infringement of a patent which claims mechanical powers in combination unless all the parts have been substantially used. The use of a part less than the whole is no infringement.

Gould v. *Rees*, 82 U.S. (15 Wall.) 187, 194 (1872):

> Where the defendant in constructing his machine omits entirely one of the ingredients of the plaintiff's combination without substituting any other, he does not infringe, and if he substitutes another in the place of the one omitted, which is new or which performs a substantially

different function, or if it is old, but was not known at the date of the plaintiff's invention as a proper substitute for the omitted ingredient, then he does not infringe.

Dunbar v. *Myers*, 94 U.S. (9 Otto) 187, 202 (1876): "[I]t is settled law, that, where the respondent in constructing his machine omits one of the ingredients of the complainant's combination, he does not infringe the complainant's patent."

Water-Meter Co. v. *Desper*, 101 U.S. (11 Otto) 332, 335-37 (1879):

> It is a well-known doctrine of patent law, that the claim of a combination is not infringed if any of the material parts of the combination are omitted. It is equally well known that if any one of the parts is only formally omitted, and is supplied by a mechanical equivalent, performing the same office and producing the same result, the patent is infringed.
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> * * * *
>
> It may be observed, before concluding this opinion, that the courts of this country cannot always indulge the same latitude which is exercised by English judges in determining what parts of a machine are or are not material. Our law requires the patentee to specify particularly what he claims to be new, and if he claims a combination of certain elements or parts, *we cannot declare that any one of these elements is immaterial. The patentee makes them all material by the restricted form of his claim. We can only decide whether any part omitted by an alleged infringer is supplied by some other device or instrumentality which is its equivalent*. [Emphasis added.]

Accord Case v. *Brown*, 69 U.S. (2 Wall.) 320, 327-28 (1864); *Gill* v. *Wells*, 89 U.S. (22 Wall.) 1, 26-30 (1874); *Fuller* v. *Yentzer*, 94 U.S. (4 Otto) 288, 297 (1876); *Gage* v. *Herring*, 107 U.S. (17 Otto) 640, 648 (1882); *Fay* v. *Cordesman*, 109 U.S. 408, 420-421 (1883); *Rowell* v. *Lindsay*, 113 U.S. 97, 102 (1885); *Sargent* v. *Hall Safe & Lock Co.*, 114 U.S. 63, 86 (1885); *Brown* v. *Davis*, 116 U.S. 237, 252 (1886); *Yale Lock Mfg. Co.* v. *Sargent*, 117

U.S. 373, 378 (1886); *McClain* v. *Ortmayer*, 141 U.S. 419, 425 (1891); *Wright* v. *Yuengling*, 155 U.S. 47, 52 (1894); *Black Diamond Coal Mining Co.* v. *Excelsior Coal Co.*, 156 U.S. 611, 617-18 (1895); *Cimiotti Unhairing Co.* v. *American Fur Ref. Co.*, 198 U.S. 399, 410 (1905).

In accordance with the Supreme Court precedent, the Court of Claims, whose decisions are binding on this court, *South Corp.* v. *United States*, 690 F.2d 1368, 1370-71, 215 USPQ 657, 658 (Fed. Cir. 1982), has consistently held: "[E]ach element of a patented combination is considered to be material and essential. Thus, the omission of any one of the elements of the claimed combination avoids infringement." *Interdent Corp.* v. *United States*, 187 USPQ 523, 526 (Ct. Cl. Tr. Div. 1975), *adopted and aff'd per curiam*, 531 F.2d 547, 552, 199 USPQ 191 (Ct. Cl. 1976).

To the same effect are:

Teledyne McCormick Selph v. *United States*, 558 F.2d 1000, 1007-08, 195 USPQ 261, 267 (Ct. Cl. 1977):

> [E]ach and every clause of a claimed invention is considered to be material and essential. *See Strumskis* v. *United States*, 474 F.2d 632, 627-28, 200 Ct. Cl. 668, 676, *cert. denied*, 414 U.S. 1067, 94 S. Ct. 576, 38 L.Ed.2d 472 (1973). Accordingly, the absence of even one element and its equivalent function of a claimed invention places the accused device outside the coverage of the claims.

Strumskis v. *United States*, 175 USPQ 243, 246 (Ct. Cl. Tr. Div. 1972), *adopted and aff'd per curiam*, 474 F.2d 623, 627-28, 177 USPQ 78 (Ct. Cl.), *cert. denied*, 414 U.S. 1067 (1973):

> All the elements which make up the combination defined by claim 5 are considered to be material and necessary. Fay v. Cordesman, 109 U.S. 408, 420, 35 S. Ct. 236, 27 L.Ed. 979 (1883). Accordingly, the omission of any one of the elements making up the claimed combination avoids all charges of infringement. This last principle was announced by the Supreme Court, at least as early as 1842, in the case

of Prouty v. Draper, 41 U.S. (16 Pet.) 336, 10 L.Ed. 985, and has been consistently followed by this court.

Autogiro Co. v. *United States*, 384 F.2d 391, 403, 155 USPQ 697, 707 (Ct. Cl. 1967) (specifically analyzing a claim with means-plus-function elements):

> For there to be infringement, it is necessary that every element or its substantial equivalent be found in the accused structures. E.g., McCullough Tool Co. v. Well Surveys, Inc., 343 F.2d 381, 145 USPQ 6 (10th Cir. 1965), cert. denied 383 U.S. 933, 148 USPQ 772 (1966); Texas Co. v. Anderson-Prichard Refining Corp., 122 F.2d 829, 50 USPQ 600 (10th Cir. 1941); Alex Lee Wallau, Inc. v. J. W. Landenberger & Co., 121 F. Supp. 555, 101 USPQ 383 (S.D.N.Y. 1954); Vollink v. Holland Celery Planter Co., 33 F. Supp. 203 (W.D. Mich. 1938), aff'd 112 F.2d 576 (6th Cir. 1940).

See also Pacific Submarine & Earthquake Proof Wall Co. v. *United States*, 19 Ct. Cl. 234, 242-43 (1884).

The precedent of our other predecessor, the Court of Customs and Patent Appeals, is the same. As stated in *Sealed Air Corp.* v. *United States Int'l Trade Comm'n*:

> It is axiomatic that the claims measure the invention, and courts may neither add to nor detract from a claim. *Cimiotti Unhairing Co. v. American Fur Refining Co.*, 198 U.S. 399, 25 S.Ct. 697, 49 L.Ed. 1100 (1905); *Ohio Citizens Trust Co. v. Lear Jet Corp.*, 403 F.2d 956, 160 USPQ 11 (CA 10 1968). Sealed Air's attempt to substitute an "inventive concept" for the invention set forth in the claims is tantamount to claiming infringement based on a function or result; abstractions cannot be patented. *Westinghouse v. Boyden Power Brake Co.*, 170 U.S. 537, 18 S.Ct. 707, 42 L.Ed. 1136 (1898); *Nelson v. Batson*, 322 F.2d 132, 138 USPQ 552 (CA9 1963).

645 F.2d at 985, 209 USPQ at 477 (footnote omitted). Similarly, *Coleco Indus., Inc.* v. *United States Int'l Trade Comm'n*, 573 F.2d 1247, 1255, 197 USPQ 472, 478 (CCPA 1978), expresses

the principle as follows:

> [The doctrine of equivalents] permits a patentee to realize the full benefit of his patent grant by enabling the patentee to read his patent claims on a device which is *not* within the literal meaning of his claims. It arms a patentee against a person who merely substitutes a functionally equivalent element in a device and thereby practices the invention without bringing his device within a literal reading of the patent claims.

Accord In re Baird, 348 F.2d 974, 979, 146 USPQ 579, 584 (CCPA 1965).

That infringement is not established where an element of a claim is missing (again in the sense that no equivalent is substituted) was expressly acknowledged by this court and controlled the judgment in *Lemelson* v. *United States*, 752 F.2d 1538, 224 USPQ 526 (Fed.Cir. 1985). As held therein: "It is also well-settled that each element of a claim is material and essential, and that in order for a court to find infringement, the plaintiff must show the presence of every element *or its substantial equivalent* in the accused device." 752 F.2d at 1551, 224 USPQ at 533 (emphasis added).

ACS Hospital Systems, Inc. v. *Montefiore Hospital*, 732 F.2d 1572, 1582-83, 221 USPQ 929, 936 (Fed. Cir. 1984), similarly holds:

> We infer that the district court necessarily found that the Wells device, lacking the claimed function of overriding a locked key switch, does not function in substantially the same way as the claimed invention. That inference is supported by the record. Accordingly, we conclude that the district court's finding, that the Wells device does not infringe the Sonnenberg patent under the doctrine of equivalents, is not clearly erroneous.

In *Amstar Corp.* v. *Envirotech Corp.*, 730 F.2d 1476, 1484, 221 USPQ 649, 655, (Fed. Cir.), *cert. denied*, 469 U.S. 924 (1984), this court refused to "undermine the long-established legal principle that non-infringement is shown when an element

or step in the claims is missing from the accused product or process. . . ." *Accord Panduit Corp.* v. *Dennison Mfg. Co.*, 810 F.2d 1561, 1577, 1 USPQ2d 1593, 1604 (Fed. Cir.), *cert. denied*, 107 S. Ct. 2187 (1987); *Chemical Eng'g Corp.* v. *Essef Indus., Inc.*, 795 F.2d 1565, 1572-73, 230 USPQ 385, 390-91 (Fed. Cir. 1986); *Perkin-Elmer Corp.* v. *Westinghouse Elec. Corp.*, 822 F.2d 1528, 1533, 3 USPQ2d 1321, 1325 (Fed. Cir. 1987).

The principle that infringement requires the presence of every element or its substantial equivalent in the accused device has also been the uniform law of *every* regional circuit. *See* 7 A. Deller, *Walker on Patents* §§531, 543, 564 (2d ed. 1972 & Supp. 1985); 1 J. Hopkins. *The Law of Patents* 343 (1911) and cases cited therein.

Nothing said in *Graver Tank & Mfg. Co.* v. *Linde Air Prods. Co.*, 339 U.S. 605 (1950), represents a discarding of the principle that infringement requires an accused device to appropriate *each* element specified in a claim exactly or by an equivalent. Indeed, *Graver Tank* reaffirms that principle with guidance on what constitutes an equivalent of a required element. The Court's analysis makes clear that only if all parts of the invention as claimed have been appropriated at least equivalently can it be found that the accused infringement works "in substantially the same way." After determining that the accused and claimed compositions performed the same overall work or function (see note 3 *infra*) and achieved the same overall result, the Court directed its further analysis to the equivalency between magnesium, the ingredient specified as an element of the claim, and manganese, the ingredient substituted in the alleged infringement. In finding equivalency, the Court stated:

> Consideration must be given to the purpose for which *an ingredient* is used in a patent, the qualities it has when combined with the other ingredients, and the function which it is intended to perform.

339 U.S. at 609, 85 USPQ at 331 (emphasis added). In sum, the term "equivalents" in the "doctrine of equivalents" refers to "equivalents" of the *elements* of the claim, not "equivalents" of

the claimed invention. While a device found to be an infringement under the doctrine of equivalents is, in a sense, "equivalent" to the claimed invention, that conclusion follows from application of the doctrine. It is not the equivalency determination to which the docrine is directed, but the result thereof. To speak of a device as being an "equivalent" of the patented invention muddles the analysis.[2]

The expression "invention as a whole" does not appear in *Graver Tank*, nor did the Supreme Court even suggest in *Graver Tank* that claim elements need not be satisfied in determining infringement. The coupling of the *Graver Tank* doctrine with the expression "invention as a whole" first appears in *Hughes Aircraft Co.* v. *United States*, 717 F.2d 1351, 219 USPQ 473 (Fed. Cir. 1983). A sentence in that opinion states:

> The failure to apply the doctrine of equivalents to the claimed invention as a whole, and the accompanying demand for "obvious and exact" equivalents of two elements the presence of which would have effectively produced literal infringement, was error.

717 F.2d at 1364, 219 USPQ at 482. The conclusion could reasonably be drawn therefrom that literal infringement requires element-by-element analysis and infringement under the doctrine of equivalents discards element-by-element analysis in favor of an "invention as a whole" analysis. One difficulty of an expert in a legal field writing on a problem is the "everyone-knows-that" syndrome. One must read the *Hughes* opinion in the light of the "given" principle that, to establish infringement, each and every element of a claim, of course, must be satisfied in accordance with established precedent. The *Hughes* panel could not and did not depart from that precedent. The *Hughes* analysis was directed to the confusing concept of equivalency

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2. The Supreme Court disapproved this type of analysis as early as *Burr* v. *Duryee*, 1 Wall. 531, 573 (1863):

> The [erroneous] argument used to show infringement assumes that every combination of devices in a machine which is used to produce the same effect, is necessarily an equivalent for any other combination used for the same purpose. This is a flagrant abuse of the term "equivalent."

under the doctrine and the different concept of equivalency under section 112-6. When it spoke of the doctrine applying to the "invention as a whole," it was not *by implication* or *sub silentio* rejecting the All Elements Rule. It was subsequently explained that the "statement dealt with an *infringement* inquiry implicating an entire claim, as distinguished from a section 112 ¶6 inquiry implicating only a 'means plus function' limitation of a claim." *See Perkin-Elmer*, 822 F.2d at 1532-33, 3 USPQ2d at 1324-25 (emphasis supplied). As a careful reading of *Hughes* makes clear, the *elements* of the claim define the metes and bounds of protection, and an equivalent of *each element* of the claim was found in the accused device. (Davis, J., disagreeing that an equivalent of each element was present.)

The legal error this court noted in *Hughes* was that the trial court restricted its equivalency inquiry to "obvious and exact" equivalents of the *disclosed structural embodiment* of certain means-plus-function elements. Equivalency of *structure* of disclosed means is a section 112-6 inquiry. *Data Line Corp.* v. *Micro Technologies, Inc.*, 813 F.2d 1196, 1201, 1 USPQ2d 2052, 2055 (Fed. Cir. 1987). Thus, had equivalency of structure been present for each means-plus-function element, the claim would have been literally infringed. The court then analyzed each of the elements which wre admittedly not present *literally* in the accused device, elements (e), (f), and (g), and held that *each* was present by a means in the accused device which performed *an equivalent function*.[3] 717 F.2d at 1364-66, 219 USPQ at 483-84. Thus, the *Hughes* case took no different view of the law.

The above precedent on the legal standard for infringement is not simply a policy choice by the courts. Other precedent permits no lesser standard. Violation of rights arising from a patent grant carries serious penalties. Each grant is in effect an extension of the statute itself. As a matter of due process under

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3. Part of the misreading of Hughes is apparently due to the double "function" inquiry — one being the *overall* function [work] of the device; the other the function of the means-plus-function *element*. The "function" in the function/way/result test of *Graver Tank* is not the "function" of a single means element. The latter is part of the inquiry into whether the accused device works in the "same way."

the fifth amendment, reasonable notice must be given to the public of what conduct must be avoided. Whether in civil or criminal proceedings, it is unequivocally established that that basic right to notice applies. *A.B. Small Co.* v. *American Sugar Ref. Co.*, 267 U.S. 233, 239 (1925). Thus, Congress placed in the statute the requirement that the patent application "conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." 35 U.S.C. §112-2 (1982). That requirement reflects the need for notice of what constitutes violation of a patentee's rights. The public cannot be held to "obedience to a rule or standard which was so vague and indefinite as really to be no rule or standard at all." *A.B. Small*, 267 U.S. at 239. Further, the courts cannot, by interpretation, place a gloss on the statutory requirement which has that effect. *Bouie* v. *City of Columbia*, 378 U.S. 347, 352 (1964). An infringement standard as vague as application of the "invention as a whole," which permits claim limitations to be read out of the claim, would nullify the statutory requirement and violate due process.

The doctrine of equivalents was *created* as a matter of equity, but its *application* does not depend simply on "equities." Infringement on the basis of judicial fiat or jury sympathies resolving the vague question of whether a "fraud" has been committed on the "invention as a whole" *cannot* be the law. *See A.B. Small*, 267 U.S. at 239 (due process contravened where no specific or definite act was forbidden and liability depended on acts being "unjust and unreasonable in the estimation of the court and jury").

United States Court of Appeals for the Federal Circuit

PENNWALT CORPORATION, Appellant/Cross-Appellee,	:	
v.	:	Appeal Nos. 85-1882 and 85-1933.
DURAND-WAYLAND, INC., Appellee/Cross-Appellant.	:	

NEWMAN, *Circuit Judge*, commentary.

This court, sitting *in banc*, has dealt a conspicious change to a major jurisprudence in patent cases: the judicially created "doctrine of equivalents."

The court has adopted a view of the "doctrine" that facially contradicts the leading decisions of this court and of the Supreme Court. The court has also ordered a dramatic retrenchment in its equitable authority. Yet the majority declines to distinguish or discuss its departure from binding precedent, indeed declines even to cite this court's closest decisions. The majority can not be oblivious to the *in banc* weight of its opinion, or to the muddle of uncertainty that it will cause.

This court is bound by *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 85 USPQ 328 (1950), and by our own extensive precedent as represented by *Caterpillar Tractor Co. v. Berco, S.P.A.*, 714 F.2d 1110, 219 USPQ 185 (Fed. Cir. 1983); *Hughes Aircraft Co. v. United States*, 717 F.2d 1351, 219 USPQ 473 (Fed. Cir. 1983); *Thomas & Betts Corp. v. Litton Systems, Inc.*, 720 F.2d 1572, 220 USPQ 1 (Fed. Cir. 1983); *Carmen Industries, Inc. v. Wahl*, 724 F.2d 932, 220 USPQ 481 (Fed. Cir. 1983); *Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 221 USPQ 669 (Fed. Cir.), *cert. denied*, 469 U.S. 857 (1984); *IACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 221 USPQ 929 (Fed. Cir. 1984); *Martin v. Barber*, 755 F.2d 1564, 225 USPQ 233 (Fed. Cir. 1985); *Loctite Corp. v. Ultraseal, Ltd.*, 781 F.2d 861, 228 USPQ 90 (Fed. Cir.

1985); *Great Northern Corp. v. Davis Core & Pad Co.*, 782 F.2d 159, 228 USPQ 356 (Fed. Cir. 1986); *Moeller v. Ionetics, Inc.*, 794 F.2d 653, 229 USPQ 992 (Fed. Cir. 1986); *Chemical Engineering Crop. v. Essef Industries, Inc.*, 795 F.2d 1565, 230 USPQ 385 (Fed. Cir. 1986); *Texas Instruments, Inc. v. U.S. Int'l. Trade Comm.*, 805 F.2d 1558, 231 USPQ 833 (Fed. Cir. 1986); *Perkin-Elmer Corp. v. Westinghouse Electric Corp.*, , 882 F2d. 1528, 3 USPQ2d 1321 (Fed. Cir. 1987); and others. The dissent, recognizing *stare decisis*, challenged the majority to explain.

The majority does not respond. However, one judge has written a personal opinion that this court's precedent is wrong and that *Graver Tank* has, since its appearance in 1950, been misinterpreted. This court's leading decision on equivalency[1], factually on all fours with the case at bar, is dismissed as having been written by a judge who suffered from the " 'everyone-knows-that' syndrome", and as having been "misread" ever since. "Additional views", slip op. at 12-13. The majority, *in banc*, remains silent.

I must express dismay at this judicial style. The technology-based community can not be reassured by our avoidance of the responsibility, so recently assigned to this court, for coherent guidance in the patent law. Critical changes should not be made within a stonewall of silence.

I

THE ISSUE ON APPEAL

Although many issues were raised by appellant Pennwalt, the majority disposed of the case on a single, novel question: can an accused machine *ever* be "equivalent" to a patented machine, in accordance with the doctrine of equivalents, if the accused machine omits any "function" (as the majority calls it) that appears in the patent claim. To this question the majority's

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1. *Hughes Aircraft Co. v. United States*, 717 F.2d 1351, 219 USPQ 473 (Fed. Cir. 1983), has been cited in over eighty published decisions of this and other courts.

answer is an emphatic NO, such that infringement in such cases is defeated as a matter of law, immune from the scrutiny of equity and the precedent of the Supreme Court.

The subsidiary question raised by the majority opinion is: when is a "function" omitted? Is it omitted when it is consolidated with another "function", or when less than all the provisions of a complex claim clause are performed? What if the function is peripheral to the invention, or becomes superfluous due to unrelated technological advance? Is every decriptive word in a claim clause a "function"? Is every "function" a "limitation"? (see the distinction between "element" and "limitation" made in *Perkin-Elmer v. Westinghouse*, 822 F.2d at 1533 n.9, 3 USPQ 2d at 1325 n.9).

All of these aspects are involved in this case, and are not discussed by the majority, although they are tacitly decided against the patentee.

The majority's decision should be viewed in the context of the case on appeal. The Pennwalt invention is a sorting machine. The item to be sorted, such as fruit, is weighed and its color is determined, in a device whose movements and actions are electronically controlled; finally the friut is discharged into a bin based on its color and weight. A device that successfully sorted by both color and weight was new to the sorting art, and the Pennwalt machine was mechanically and electronically complex.

The majority discusses only Pennwalt's claim 10, which, like the other claims, is in the means-plus-function form authorized in 35 U.S.C. §112 ¶6[2]. Claim 10 includes clauses directed to the functions of weighing, color determination, and discharge, and to the various electronic functions. The disputed "function", that on which the majority decision turns, relates to the indication of the fruit's position as it moves through the sorter. Claim 10 follows:

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2. 35 U.S.C. §112 ¶6: An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

10. An automatic sorting apparatus comprising.

electronic weighing means for generating a signal proportional to the weight of an item to be sorted,

first reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria,

first comparison means for comparing the signal generated by said electronic weighing means to the reference signals provided by said first reference signal means,"

optical detection means for generating a signal proportional to the color of an item to be sorted,

second reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria,

second comparison means for comparing the signal generated by said optical detection means to the reference signals provided by said second reference signal means, and generating a signal therefrom,

clock means for incrementally, signalling changes in the position of the item to be sorted,

first position indicating means responsive to a signal from said clock means and said signal from said second comparison means for continuously indicating the position of an item to be sorted while the item is in transit between said optical detection means and said electronic weighing means,

second position indicating means responsive to the signal from said clock means, the signal from said first comparison means and said first position indicating means for generating a signal continuously indicative of the position of an item to be sorted after said item has been weighed, and

discharge means responsive to the signal from said second position indicating means for discharging the item at a predetermined one of a plurality of sorting positions.

There is no issue that all of the "means" set out in all of the claim clauses are found in the accused Durand-Wayland model, except for that of "continuously indicating" the fruit's position while it is in transit to the weighing means and then to the discharge bin, as described in the penultimate two clauses. In the accused device a modified electronic memory keeps track of the movement of the fruit, and indicates when it reaches the weighing means and the discharge bin; that is, it indicates when the fruit has reached the next stop in its passage through the device. But the "continuous indication of the fruit's position while in transit is superfluous and is not done. (Both sides testifed that "continuous" indication is not done, in either the Pennwalt commercial device or the accused device.)

According to the majority, because the position indication is not"continuous", a claimed "function" is not performed. All-"function's" mentioned in claims are defined by the majority as essential, simply because they're there, whatever their role in the patented invention and whatever their part in the clause in which they appear. The majority states the sweeping rule that if "even a single function required by a claim or an equivalent function is not performed", that ends the inquiry under the doctrine of equivalents. The majority bars consideration of the significance of any "function" in the overall invention or in any part thereof, and holds that the omission of any "function" that is mentioned in any claim clause *ipso facto* transports the accused device beyond the reach not only of literal infringement, but also of the doctrine of equivalents.

The majority thus bars consideration of the role of "continuous" indication in the Pennwalt invention viewed as a whole, based on the absence of "element-by-element correspondence" between the claimed invention and the accused device.

The majority approach is apt for determining literal infringement. One-to-one correspondence between every element of a claim and an accused device is the standard formula for

inquiry into literal infringement. But this formula is an incorrect application of the doctrine of equivalents, contrary to the precedent of the Supreme Court and this court.

I do not write these additional views because I disagree with the majority result; although I do, for the reasons stated in the dissenting opinion. I write to balance the historical record on which the majority bases its decision.

II

PRINCIPLES OF THE DOCTRINE OF EQUIVALENTS AS EXPOUNDED BY THE SUPREME COURT

The Supreme Court developed and applied, over more than a century of thoughtful analysis, the basic principles of the doctrine of equivalents. From its earliest appearance, in this nation and in the British courts of chancery, the doctrine of equivalents was recognized as an equitable remedy against wrongful appropriation of a patented invention.

Depending on the invention and the device in controversy, the Supreme Court variously applied the doctrine of equivalents to the patented invention viewed as a whole, or to parts or elements thereof. Throughout its history, the Court avoided constraining the doctrine with rigid formulae. Founded on the principles of equity, the doctrine of equivalents evolved as patent law evolved. It reflected changes in patent practice, and it accommodated changes in technology over periods of dramatic industrial growth. Its supreme purpose was and is to serve the interests of justice.

The Supreme Court often discussed the place in advancing technology of the invention it was reviewing, when determining the just scope merited by a patented invention as against an accused device. The Court recognized that some elements of a patented device were essential, and others less so; and as the law and style of patent claims evolved, the Court's discussions of equivalency kept pace.

A body of judicial decision arose that is extensive, well developed, and remarkably constant. That body of decision has not been cited, discussed, or recognized by the majority.

A

Early Courts Determined Infringement Based on Substantial Similarity to the Description of the Invention.

1. The Patent Act of 1793 did not provide for patent examination or patent "claims".

Judicial determinations of equivalency were made before as well as after the development of systems of patent examination and patent claims. The decisions must be understood in the context of the practices of the time.

The patent grant before 1793 was not automatic, but was subject to review by a committee consisting of the Secretary of State, the Secretary of War, and the Attorney General. Act of April 10, 1790, ch.7, §1, 1 Stat. 109, 109-10 (1790). History records that the increasing burdens of this review led to change in 1793, whereby the patent was routinely granted, subject only to formalities and the payment of a fee.

The Patent Act of 1793, ch. 11, §3, 1 Stat. 318, 321-22 (1793), required the applicant to

> deliver a written description of his invention, and of the manner of using, or process of compounding the same, in such full, clear, and exact terms, as to distinguish the same from all other things before known . . . .

In infringement actions the accused device was compared with the description in the patent document. Defenses such as lack of novelty, or prior use, were considered by the courts. A finding of infringement did not require precise correspondence between the description and the accused device. The trial courts determined, often by jury, whether there was "substantial similarity" between the accused device and that described in the patent. For example, in *Odiorne v. Winkley*, 18 F. Cas. 581, 582 (C.C.D. Mass. 1814) (No. 10,432), the court, Story, J., charged the jury:

> The first question for consideration is, whether the machines used by the defendant are substantially, in their

> principles and mode of operation, like the plaintiff's machines. If so, it was an infringement of the plaintiff's patent to use them. . . . Mere colorable alterations of a machine are not sufficient to protect the defendant.

See also Lowell v. Lewis, 15 F. Cas. 1018, 1021 (C.C.D. Mass. 1817) (No. 8,568) ("whether the defendant has violated the patent-right of the plaintiff . . . depends upon the fact, whether the pumps of Mr. Perkins and of Mr. Baker are substantially the same invention").

Our research showed no issue of equivalency, i.e. "substantial" similarity, in the cases that reached the Supreme Court during this early period, although several other significant aspects of patent law were treated by the Court. *See, e.g., Evans v. Eaton*, 16 U.S. (3 Wheat.) 454 (1818), the first patent infringement decision of the Supreme Court.

2. The Patent Act of 1836 provided for patent examination and for a statement of the inventor's "claim".

The Patent Act of 1836, ch. 357, 5 Stat. 117 (1836), was enacted at a time of burgeoning industrial activity and creativity, growth in patent filings[3] and, inexorably, increasing infringement litigation. Section 6, 5 Stat. 119, provided that an applicant for patent

> shall particularly specify and point out the part, improvement, or combination, which he claims as his own invention or discovery.

It is not clear from the legislative history whether the purpose of the requirement for particularity was to facilitate examination or enforcement, but the style and content of the ensuing "claims" were significantly different from those of later practice. The applicant simply named the broad features that embodied the invention, accompanied by such words as "substantially as set

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3. The Act created the Patent Office, headed by a Commissioner of Patents. Construction of a Patent Office Building (now the National Portrait Gallery) was started in 1836.

forth". The claims

> served merely to call attention to what the inventor considered the salient features of his invention. The drawings and description were the main thing, the claims a mere adjunct thereto.

R. Ellis, *Patent Claims*, §3 (1949) [hereinafter "*Ellis*"]. *Ellis* cites a typical claim, published by the Patent Office in 1869:

> [1.] The combination of the cutters EE, and the feeding rollers II and JJ, substantially as and for the purpose hereinbefore set forth.

Id., §6. This is the style of claim that was before the Court in most of the early decisions that are cited in asserted support of the majority position. The Court explained in *The Corn Planter Patent*, 90 U.S. (23 Wall.) 181, 218 (1874), that a clause such as "substantially as set forth"

> throws us back to the specification for a qualification of the claim, and the several elements of which the combination is composed.

To this extent early claim form was a precursor of the "means-plus-function" form of today,[4] in that they both incorporate by reference the description in the specification and equivalents thereof.

Infringement continued to be determined by comparison of the accused device with the description in the specification. *See, e.g., Burr v. Duryee*, 68 U.S. (1 Wall.) 531, 573 (1864):

> [An infringement] is a copy of the thing described in the specification of the patentee, either without variation, or

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4. 35 U.S.C. §112 ¶6 provides that a functional claim shall be construed to cover the means described in the specification and equivalents. *See* n.2 *ante*. In 1946 the Court had held, *Halliburton Oil Well Cementing Company v. Walker*, 329 U.S. 1, 12 (1946), that this form of claim was not limited to "actual equivalents" of the means disclosed, and therefore was invalid. Section 112 ¶6 was enacted to reverse that ruling. P.J. Federico, *Commentary on the New Patent Act*, 35 U.S.C.A. 1, 25 (1954).

> with such variations as are consistent with its being in substance the same thing.

As will be discussed, the doctrine of equivalents flowered during this period, although patent claims played a quite limited role in patent enforcement, serving more to identify the essential features of an invention that to set limits to the scope thereof.

3. The Patent Act of 1870 started the move to increased specificity in claiming.

Section 26 of the Patent Act of 1870, ch. 230, 16 Stat. 198, 201 (1870), for the first time required that the applicant

> particularly point out *and distinctly claim* the part, improvement, or combination which he claims as his invention or discovery. [emphasis added]

Judicial decisions during this period show that the transition toward greater specificity was gradual indeed, but by the early 1900s claims "became much more self-sufficient in that they gave the cooperative relationship of the elements enumerated, instead of a mere catalog of elements". *Ellis*, §6.

There evolved during this period a complex jurisprudence on equivalents, wherein the doctrine was applied to the circumstances of each case, as justice required. As in earlier periods, a patent's claims were less significant in infringement litigation than was the description of the invention, and it was from the specification and drawings that the invention's substance was determined. However, patent claims became of increased importance as they began to reflect adjustments made during the examination process and, at first occasionally and then more frequently, claims were referred to by the courts in determinations both of literal infringement and of infringement by application of the doctrine of equivalents.

4. Claim form continued to evolve after the Patent Act of 1952.

According to the modern style, patent claims no longer merely claim the salient features, the "heart" of the invention.[5] Our predecessor court stated in *In re Lundberg*, 244 F.2d 543, 548, 113 USPQ 530, 534 (CCPA 1957):

> [N]otwithstanding the [last] paragraph of section 112, it is the language itself of the claims which must particularly point out and distinctly claim the subject matter which the applicant regards as his invention, *without limitations imported from the specification*, whether such language is couched in terms of means plus function or consists of a detailed recitation of the inventive matter. [emphasis added]

This practice is in sharp contrast with that of the 19th and early 20th centuries. There was a gradual, erratic, but inexorable transition to the requirement that the claims contain sufficient detail so that they can stand alone, without reliance on the specification to show distinctions from the prior art. *Ellis*, §4, describes this as claiming the perimeter of an invention, rather than its core. Deller calls it "stak[ing] out the metes and bounds of the boundaries", attributing enhanced rigor in claim drafting to the Supreme Court's decision in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966). 1 A. Deller, *Patent Claims*, v-vi (2d ed. 1971). Typical of this form is the Pennwalt claim shown *ante*, with its multiple clauses delineating the entire sorter and its operation. Despite the changes in form and content of patent claims over this long period, the principles of the doctrine of equivalents remained constant.

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5. An apparent exception, the "Jepson" form of claim, occasionally continues to be used. See *Ex parte Jepson*, 243 Off. Gaz. Pat. Office 525 (Ass't. Comm'r. Pat. 1917).

B

The Supreme Court Applied the Doctrine of Equivalents to the Invention as a Whole and to Parts thereof, as the Facts Required.

The Supreme Court decisions illustrate consistent judicial application of the doctrine of equivalents, in accordance with the principles of equity and in a manner appropriate to the facts of each case. The doctrine of equivalents was not restricted by rigid formulae, but turned on the totality of circumstances.

Thus, the Court applied the doctrine to broad and to narrow inventions, remarking that each merited the benefits of the doctrine as its facts warranted. "Pioneer" inventions enjoyed a wider scope of equivalents than "mere narrow improvements". Combinations comprising novel elements drew a more benevolent judicial perspective than combinations consisting solely of old elements.

The Supreme Court's first discussion of the principles of equivalency appeared in *Winans v. Denmead*, 56 U.S. (15 How.) 330 (1853). The Court expressed majority and dissenting views barely distinguishable from those in *Graver Tank*, a century later.

In *Winans* the patentee claimed a circular railroad car whose conical design achieved several advantageous benefits; the accused device was octagonal, of otherwise similar conical design, and achieved the same advantages. Addressing the question of whether the patentee's coverage was limited to the embodiment described in the specification, the Court said:

> [T]he property of inventors would be valueless, if it were enough for the defendant to say, your improvement consisted in a change of form; you describe and claim but one form; I have not taken that, and so have not infringed.
>
> * * *
>
> Where form and substance are inseparable, it is enough to look at the form only. Where they are separable; where *the whole substance of the invention* may be copied in a different form, it is the duty of courts and juries to look

> through the form for the substance of the invention—for that which entitled the inventor to his patent, and which the patent was designed to secure; where that is found, there is an infringement; and it is not a defense, that it is embodied in a form not described, and in terms claimed by the patentee. [emphasis added]

56 U.S. at 342-43. The Court held that the circular and octagonal shapes were substantially the same, in that the accused device embodied "the patentee's mode of operation, and thereby attain[ed] the same kind of result as was reached by his invention." *Id.* at 344. The dissenting opinion argued eloquently for limitation to the circular shape as described:

> Fulness, clearness, exactness, preciseness, and particularity, in the description of the invention, its principle, and of the matter claimed to be invented, will alone fulfil the demands of congress or the wants of the country. Nothing, in the administration of this law, will be more mischievous, more productive of oppressive and costly litigation, of exorbitant and unjust pretensions and vexatious demands, more injurious to labor, than a relaxation of these wise and salutary requisitions of the act of congress.

Id. at 347.

The decisions since *Winans*, implementing the Court's holding, have given full respect to the equitable purposes of the doctrine. The decisions show a consistent concern for attempted evasions of patent rights by changes that do not affect the substance of the invention. This concern is balanced by judicial restraint against unwarranted stretch of the patent right beyond its just limits. Due to such restraint, exercised in the context of the facts and circumstances of each case, the forebodings expressed in the *Winans* dissent have not been realized. This dissenting view was not iterated by the Court until it appeared, again in dissent, in *Graver Tank*, ninety-seven years later. This minority view had not, until today, prevailed.

Following is a sampling of the Court's decisions, time and again affirming the principles of the doctrine, as the Court applied it to an expanding variety of circumstances.

In *McCormick v. Talcott*, 61 U.S. (20 How.) 402 (1858), the Court distinguished between the breadth of equivalents to which an invention of a new device is entitled, and improvements in a known device:

> If he be the original inventor of the device or machine called the divider, he will have a right to treat as infringers all who make dividers operating on the same principle, and performing the same functions by analogous means or equivalent combinations, even though the infringing machine may be an improvement on the original, and patentable as such. But if the invention claimed by itself but an improvement on a known machine be a mere change of form or combination of parts, the patentee cannot treat another as an infringer who has improved the original machine by use of a different form or combination performing the same functions.

Id. at 404-05.

In *Burr v. Duryee*, 68 U.S. at 572-73, the Court elaborated, continuing its treatment of the invention as a whole, although not using these precise words:

> [An infringement] is a copy of the thing described in the specification of the patentee, either without variation, or with such variations as are consistent with its being *in substance the same thing* . . . . If the invention of the patentee be a machine, it will be infringed by a machine which . . . performs the same service or produces the same effect in the same way, or substantially the same way. [emphasis added]

(citing G. Curtis, *Law of patents* (2d Ed.), a treatise published in 1854). In *Machine Co. v. Murphy*, 97 U.S. (7 Otto) 120, 125 (1878), the Court viewed both the machine in its entirety, and its separate elements, in applying the principles of equivalency:

> [I]n determining the question of infringement, the court or jury . . . [is] to look at *the machines or their several devices or elements* in the light of what they do, or what office or function they perform, and how they perform it, and to find that one thing is substantially the same as another, if it performs substantially the same function in substantially the same way to obtain the same result . . . . [emphasis added]

The claim in *Consolidated Valve Co. v. Crosby Steam Gauge & Valve Co.*, 113 U.S. 157, 162 (1885), illustrates the continuing style of claim drafting, wherein the claim broadly states the essential elements of the invention, with reference to the specification:

> [A] safety valve with the circular or annular flange or lip *c c*, constructed in the manner, or substantially in the manner, shown, so as to operate as and for the purpose herein described.

The Court discussed the inventor's structure and the differences in the accused device and held that:

> When the ideas necessary to success are made known, and a structure embodying those ideas is given to the world, it is easy for the skilful mechanic to vary the form by mechanism which is equivalent, and is, therefore in a case of this kind, an infringement.

Id. at 179.

Whether dealing with inventions it called "pioneer", or with less dramatic advances, the Court looked for the substance of the patentee's contribution as described in the specification and as claimed, deciding the issue equitably and as the particular facts occasioned. *See, e.g., Morey v. Lockwood*, 75 U.S. (8 Wall.) 230, 242 (1868) (the patentees "are protected . . . against the use of any form . . . that embodies substantially their ideas and mode of operation"); *Blake v. Robertson*, 94 U.S. (4 Otto) 728, 733 (1877) (stone-crushing machine that used rods and levers held infringed by machine that used hydraulic pressure); *Tilghman v. Proctor*, 102 U.S. (12 Otto) 707, 732 (1881) (various

improvements did not alter the essential character of the patented process); *Clough v. Barker*, 106 U.S. (16 Otto) 166, 178 (1882) (patentee of a new combination is entitled to "hold as infringements all valve regulations, applied to such a combination, which perform the same office in substantially the same way as, and were known equivalents for, his form of valve regulation"); *Hyt v. Horne*, 145 U.S. 302, 309 (1892) ("merely the use of an old and well known mechanical equivalent, and obviously intended to evade the wording of the claims of the Hoyt patent"); *Deering v. Winona Harvester Works*, 155 U.S. 286, 302 (1894) ("Otherwise the infringer might take the most important part of a new invention and, by changing the method of adapting it to the machine to which it is an improvement, avoid the charge of infringement").

In *Sanitary Refrigerator Co. v. Winters*, 280 U.S. 30, 42 (1929), the Court restated the oft-quoted principles:

> [G]enerally speaking, one device is an infringement of another "if it performs substantially the same function in substantially the same way to obtain the same result. . . . Authorities concur that the substantial equivalent of a thing, in the sense of the patent law, is the same as the thing itself; so that if two devices do the same work in substantially the same way, and accomplish substantially the same result, they are the same, even though they differ in name, form, or shape." *Machine Co. v. Murphy*, 97 U.S. 120, 125. . . . A close copy which seeks to use the substance of the invention, and, although showing some change in form and position, uses substantially the same devices, performing precisely the same offices with no change in principle, constitutes an infringement.

The principles of equivalency are not limited to mechanical devices. *Ellis* discusses in §59 judicial decisions to the effect that equivalency may be found on "change in chemical nature or structure of a composition ingredient or process reagent, which does not affect the operation or function of the composition or the process *as a whole*" (emphasis added). In more recent commentary, Professor Chisum remarks, 4 D. Chisum, *Patents*

§18.04 [1], at 18-33 n.3 (1987): "Note that equivalency is still determined by comparing the *claimed* subject matter *as a whole* and the accused device." (emphasis in original).

The Court has applied the converse of the doctrine, to the effect of restricting, rather than enlarging, the *literal* scope of claims. In *Westinghouse v. Boyden Power Brake Co.*, 170 U.S. 537, 568 (1898), expounding the so-called "reverse doctrine of equivalents", the Court said:

> The patentee may bring the defendant within the letter of his claims, but if the latter has so far changed the principle of the device that the claims of the patent, literally construed, have ceased to represent his actual invention, he is as little subject to be adjudged an infringer as one who has violated the letter of a statute has to be convicted, when he has done nothing in conflict with its spirit and intent.

The "reverse" doctrine is seen to be no more than a limitation on the scope of the claims, based on the patentee's description in the specification. It reflects the Court's continuing emphasis on the substance of the invention, viewed in its entirety, rather than on the literal form of the claims, such that if justice should require restriction rather than expansion of their literal text, the courts are empowered to do so.

I observe that the majority herein intermingles the principles of literal infringement with those of equivalency. But the absence of literal infringement does not bar access to the doctrine of equivalents; it is the prelude to its application. This principle is as old as the doctrine itself, being the foundation on which the doctrine is based. *See Winans v. Denmead*, 56 U.S. (15 How.) at 342-43:

> If the machine complained of were a copy, in form, of the machine described in the specification, of course it would be at once seen to be an infringement. It could be nothing else. It is only ingenious diversities of form and proportion, presenting the appearance of something unlike the thing patented, which give rise to questions. . . .

The principle has been classically stated:

> Of course the fact that verbally the infringing process is not within the claim is no objection to the application of the doctrine of equivalents; indeed it creates the very occasion which should evoke it. [citations omitted]

Musher Foundation, Inc. v. Alba Trading Co., 150 F.2d 885, 887, 66 USPQ 183, 185 (2d Cir.) (L. Hand, J.), *cert. denied*, 326 U.S. 770 (1945).

C

The Court Recognized that some Inventions are Entitled to a Broader Range of Equivalents than other Inventions.

The doctrine of equivalents has frequently been invoked by patentees, but it has far less frequently been applied in their favor. Courts have judiciously adapted its principles to the facts at issue, cognizant of the complex of interactions between the rights of patentees, on the one hand, and those who seek to use the inventions of others, whether by colorable imitation or by inventive modification. During development and application of a wise jurisprudence on such matters, the courts have avoided subjecting themselves to rigid rules, for the great variety of technological situations are not amenable to all-encompassing rules. My concern is that the courts will now be subjected to a new and far-reaching rule, the need for which has not been shown and the disadvantages of which, to courts and to parties, are manifest.

Precedent shows that in the course of elaboration of the doctrine of equivalents, the courts have emphasized that its application varies with the "character" of the invention, as well as with the nature of the differences between the accused device and the patented invention. *See, e.g., Miller v. Eagle Mfg. Co.*, 151 U.S. 186, 207 (1893):

> The range of equivalents depends upon the extent and nature of the invention. If the invention is broad or primary in its character, the range of equivalents will be correspondingly broad, under the liberal construction which the courts give to such inventions.

Dealing with an invention that it described as "pioneer", the Court said in *Morley Sewing Machine Co. v. Lancaster*, 129 U.S. 263, 273 (1889):

> Morley, having been the first person who succeeded in producing an automatic machine for sewing buttons of the kind in question upon fabrics, is entitled to a liberal construction of the claims of his patent. He was not a mere improver upon a prior machine which was capable of accomplishing the same general result; in which case, his claims would properly receive a narrower interpretation. This principle is well settled in the patent law, both in this country and in England. [citations omitted]

In *Hobbs v. Beach*, 180 U.S. 383, 399 (1901), the Court described the patent as a "pioneer in its limited field":

> We are not concerned with the subordinate differences in the mechanism, least of all with the different names given by Horton to parts of his machine similar to the corresponding parts in the Beach patent. As the two machines are alike in their functions, combination and elements, it is unnecessary to go further and inquire whether they are alike or unlike in their details.

The Court did not limit application of the doctrine to "pioneers". In *Continental Paper Bag Co. v. Eastern Paper Bag Co.*, 210 U.S. 405, 415 (1907), the Court said:

> It is manifest, therefore, that it was not meant to decide that only pioneer patents are entitled to invoke the doctrine of equivalents, but that it was decided that the range of equivalents depends upon and varies with the degree of invention.

See also, e.g., Kokomo Fence Machine Co. v. Kitselman, 189 U.S. 8, 24 (1903) (patents were not for pioneer inventions, and differences in means and operation between the machines was such that there was no infringement); *Brill v. Washington Railway & Elec. Co.*, 215 U.S. 527, 533 (1910) (Because of the close prior art, there "would be little room for the doctrine of

equivalents. The defendant's device . . . does not infringe the very narrow claim which is the most that in any view could be allowed"); *Abercrombie & Fitch Co. v. Baldwin*, 245 U.S. 198, 209 (1917) (infringement by well-known substitute); *Brothers v. United States*, 250 U.S. 88, 89 (1919) ("plaintiff's invention was broadly new, a pioneer in its line, and the patent [was] entitled to a broad construction and the claims to a liberal application of the doctrine of equivalents").

I belabor that in all cases the Court viewed the substance of the patented invention, avoided the rigors of formulae and dogma, and applied the doctrine of equivalents as the facts and circumstances, and justice, merited.

D

The Court Recognized that Some Elements of an Invention May be More Important than Others.

In harmony with changes in the style of claim drafting, the Court recognized that it was necessary to separate the important and unimportant aspects of an invention in order correctly to apply the doctrine of equivalents. For example, in *Machine Co. v. Murphy*, 97 U.S. at 125, the Court remarked that:

> Inquiries of this kind are often attended with difficulty; but if special attention is given to such portions of a given device as really does the work, so as not to give undue importance to other parts of the same which are only used as a convenient mode of constructing the entire device, the difficulty attending the investigation will be greatly diminished, if not entirely overcome. *Cahoon v. Ring*, 1 Cliff. 620.

In *National Cash Register Co. v. Boston Cash Indicator Co.*, 156 U.S. 502, 517 (1895), the Court observed that a change in a "wholly immaterial feature" does not avoid infringement; and in *Westinghouse v. Boyden*, 170 U.S. at 561, the Court held that an enclosure for a valve, included as an express limitation of the claim, was "immaterial" in determining infringement.

In contrast, when an element was essential to the patented device[6] and was omitted entirely in an accused device, the Court denied equivalency because of the effect of the omission on the invention as a whole. *See, e.g., Black Diamond Co. v. Excelsior Co.*, 156 U.S. 611, 616-18 (1895) (no infringement because an element essential to patentability of the invention was absent in the accused device).

As summarized in *Ellis*, §33:

> An invention, however, usually has minor as well as major features. The doctrine of equivalents may be invoked as to either or both the minor and major features. . . .
>
> The less important the minor feature is relatively to the main feature, the wider the range of equivalents as applied to the minor feature. This is due to the fact that a subsidiary feature of an invention can be radically changed with less effect on *the invention as a whole* than a relatively minor change in the main feature of the invention. [emphasis added]

It was manifest in the Court's repeated evaluations of the role of various features of patented inventions that equivalency was determined in respect of the invention as a whole.

In the early style of claim drafting minor features were not written into the claims, leaving only essential features. This is

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6. Application of the doctrine of equivalents is subject to the principles of prosecution history estoppel and estoppel based on the prior art, aspects not here directly at issue, but pertinent to determination, for example, of whether a claim element is essential to the patented invention. There are old roots to this extensive body of decision, which has classically restrained the doctrine from unduly broad application. *See, e.g., Shepard v. Carrigan*, 116 U.S. 593, 597 (1886); *Shriber-Schroth Co. v. Cleveland Trust Co.*, 311 U.S. 211, 220-21 (1940). As stated in *I.T.S. Rubber Co. v. Essex Rubber Co.*, 272 U.S. 429, 443 (1926):

> It is well settled that where an applicant for a patent to cover a new combination is compelled by the rejection of his application by the Patent Office to narrow his claim by the introduction of a new element, he cannot after the issue of the patent broaden his claim by dropping the element which he was compelled to include in order to secure his patent.

especially pertinent when the invention was a "combination of old elements", the subject of the following line of decisions:

E

The special case of a combination of old elements.

The Supreme Court early treated the class of invention it called a "combination of old elements" as a special case. In *Imhaeuser v. Buerk*, 101 U.S. (11 Otto) 647 (1879), the Court referred to the "special signification" of equivalency as applied to a novel combination of old elements:

> Equivalents may be claimed by a patentee of an invention consisting of a combination of old elements or ingredients . . . .
>
> Such a patentee may doubtless invoke the doctrine of equivalents as against an infringer of the patent: but the term "equivalent," as applied to such an invention, is *special in its signification*, and somewhat different from what is meant when the term is applied to an invention consisting of a new device or an entirely new machine. [emphasis added]

Id. at 655-56. In this class of invention it was only the combination that was new, such combination comprising certain essential elements.[7] The Court has consistently held that when an essential element of a combination of old elements is not present in the accused device, there is no infringement.

The critical premise is that, in a combination of old elements, each element is essential to the patented invention, and its omission "destroys the combination". As Professor Robinson explained in 1890:

> [I]t is important that the radical distinction between a combination and a simple invention should be constantly

---

7. We are not here concerned with historic variations in criteria for the patentability of "combinations", *see* H.T. Markey, *Why Not the Statute?*, 65 J. Pat. Off. Soc'y 331, 333-34 (1983), although that issue is not unrelated to the Court's treatment of infringement and equivalency of combination claims.

> remembered; for the same apparent change which, in a simple invention, would be but a substitution of equivalents might, in a combination, introduce a new idea of means . . . .
>
> [A combination's] identity depends upon the presence of each one of [the] specific elemental means . . . . Hence the removal of a single one of these subordinate means destroys the combinaton . . . .

W. Robinson, *The Law of Patents*, § 254 (1890) [hereinafter "*Robinson*"].

When applying the doctrine of equivalents to combinations of old elements, the Supreme Court recognized that for such inventions patentability depended on the novelty of the combination, and applied the doctrine commensurately. A change in an essential element of a combination of old elements produces a new combination; it is no longer the same or an equivalent combination. In the words of *Robinson*, § 253, it is a "substantive invention":

> [A]ny substitution in the essential elements of a combination which affects either the means or function of the single element passes beyond the region of equivalents into the sphere of substantive invention.

An early example of this genre is *Prouty v. Ruggles*, 41 U.S. (16 Pet.) 336, 341 (1842):

> The patent is for a combination, and the improvement consists in arranging different portions of the plough, and combining them together in the manner stated in the specification for the purpose of producing a certain effect. None of the parts referred to are new, and none are claimed as new; nor is any portion of the combination less than the whole claimed as new, or stated to produce any given result.

The Court in *Prouty* observed that the patented invention is not "the same improvement" when an essential element of the combination is omitted:

> [T]his combination . . . is the thing patented. The use of any two of these parts only, or of two combined with a third, which is substantially different, in form or in the manner of its arrangement and connection with the others; is therefore ***not the thing patented***. [emphasis added]

Id. at 341.

Thus when the only patentable aspect is the combination itself, each essential element of the combination must be present in the accused device in order to find infringement. ***Fuller v. Yentzer***, 94 U.S. (4 Otto) 288, 296-97 (1877). The Court did not deny all equivalents, but for each essential element of the combination the Court required that any equivalent must be a known substitute for the replaced ingredient. *See Imhaeuser*, 101 U.S. at 656:

> Patentees of an invention consisting merely of a combination of old ingredients are entitled to equivalents, by which is meant that the patent in respect to each of the respective ingredients comprising the invention covers every other ingredient which, in the same arrangement of the parts, will perform the same function, if it was well known as a proper substitute for the one described in the specification at the date of the patent.

The Court had established that substitution of one known structure for another in the combination did not avoid infringement, unless the effect was to change the combination as a whole. As stated in *Eames v. Godfrey*, 68 U.S. (1 Wall.) 78, 79-80 (1863):

> [A combination of old elements] differs essentially in its principles from one where the subject-matter is new.
>
> * * *
>
> Eames had a right to use any of the parts in Godfrey's combination, if he did not use the whole; and if he used all the parts but one, and for that substituted another mechanical structure substantially different in its construction and

> operation, but serving the same purpose, he was not guilty of an infringement.

See also Brooks v. Fiske, 56 U.S. (15 How.) 212, 219 (1853) ("The combination and arrangement . . . was the only novelty in the invention"); *Gould v. Rees*, 82 U.S. (15 Wall.) 187, 194 (1872) (the patented combination is avoided "if the ingredient substituted was a new one, or performs a substantially different function, or was not known"); *Gill v. Wells*, 89 U.S. (22 Wall.) 1, 26-30 (1874) ("the combination is an entirety, and that if one of the ingredients be given up the thing claimed disappears, which is an obvious truth, as the invention in such a case consists simply in the combination"); *Brown v. Davis*, 116 U.S. 237, 249 (1886) (the lever is an essential element of the combination, and replacing it with the human hand avoids infringement); *McClain v. Ortmayer*, 141 U.S. 419, 425 (1891) ("the patentee is [not] at liberty to say that the spring encircling the after wale is immaterial and useless").

Throughout this period the Court appeared to view inventions of new combinations of old elements as different from other classes of inventions. In *Seymour v. Osborne*, 78 U.S. (11 Wall.) 516, 556 (1870), the Court distinguished the "mere combination" as follows:

> Patentees, therefore, are entitled in all cases to invoke to some extent the doctrine of equivalents, but they are never entitled to do so in any case to suppress all other substantial improvements, and the rule which disallows such pretensions, if properly understood and limited, is as applicable to the inventor of a device, or even of an entire machine, as to the inventor of a mere combination, *except that* the inventor of the latter cannot treat any one as an infringer whose machine does not contain all of the material ingredients of the prior combination . . . . [emphasis added]

This distinction was carried forward in *Graver Tank*, where the Court called a combination of old ingredients a "secondary invention";

> The doctrine operates not only in favor of the patentee of a pioneer or primary invention, but also for the patentee of a secondary invention consisting of a combination of old ingredients which produce new and useful results, *Imhaeuser v. Buerk*, 101 U.S. 647, 655, although the area of equivalence may vary under the circumstances.

339 U.S. at 608.

This view of equivalency was in useful harmony with the contemporaneous style of patent claims. When the claims named only the essential elements, removal of an essential element changed the combination so that it was neither "the thing patented" nor the thing claimed. *See, e.g., Vance v. Campbell*, 66 U.S. (1 Black) 427, 429-30 (1862) ("the patentee not only described, but claimed the front flue . . . as a material and important part of the arrangement"); *Water-Meter Co. v. Desper*, 101 U.S. (11 Otto) 332, 336 (1880) ("We cannot say that the crank-shaft was an immaterial part of their combination"); *Gage v. Herring*, 107 U.S. (17 Otto) 640, 648 (1883) ("But the patentee, in his specification and in his only valid claim, has made each of the conveyors, as well as the elevator, a material part of the combination invented and patented by him"); *Fay v. Cordesman*, 109 U.S. 408, 420-21 (1883) ("if the patentee specifies any element as entering into the combination, either directly by the language of the claim, or by such a reference to the descriptive part of the specification as carries such element into the claim, he makes such element material to the combination, and the court cannot declare it to be immaterial"); *Yale Lock Mfg. Co. v. Sargent*, 117 U.S. 373, 378 (1886) (element was "made essential" by description and claim); *Wright v. Yuengling*, 155 U.S. 47, 52 (1894) ("the patentee, having described [the feature] in the specification and declared it to be an essential feature of his invention, and having made it an element of these two claims, is not now at liberty to say that it is immaterial").

This special class of cases is the subject of the "additional views" filed in support of the majority, *see* slip op. at 3-8, and additional examples are presented therein. These cases are not

authority for imposing on the doctrines of equivalents a "hoary all elements rule". *Id.* at 3. No such general rule of equivalency is enunciated in these cases.

F

Omission of an Element, or Combining or Separating Elements, May Not Avoid Application of the Doctrine of Equivalents.

Even when an accused device completely omits a claimed element, or combines separate claimed elements, such a device has been, depending on the facts of the case, subject to application of the doctrine of equivalents.

Ellis observed at § 61 that "[t]here are a few cases in which infringement has been held where an element has been omitted without any semblance of an equivalent substituted therefor." In such cases, necessarily, the courts determined that the omission of the element did not substantially affect the invention as a whole.

In *Royer v. Schultz Belting Co.*, 135 U.S. 319 (1890) the patented device was a vertical cylindrical crib with a slotted rotating shaft running its length. The claims read:

> 1. The vertical shaft B with a slot, B', and set-screws *b b b*, said shaft having a forward and back motion, substantially as and for the purpose described.
>
> 2. The pins or rollers C C C, set in the rings D and D', together with the grooved weight I, substantially as and for the purposes described.

Id. at 322. The accused device did not contain the slot, the pins or rollers, or the grooved weight. The Circuit [trial] Court held that the accused device did not infringe as a matter of law; the Supreme Court reversed, stating that the questions of whether the invention was of a primary character, and thus entitled to a broader range of equivalents despite the omitted elements, were questions of fact for the jury.

In *United States v. Harvey Steel Co.*, 227 U.S. 165 (1913), the Supreme Court affirmed the Court of Claims' holding that the claimed invention was not avoided by omitting the sand backing that was an element in the claim. The claim read in part:

> 1. The herein-described method of producing a decrementally hardened tenacious armor plate, which consists of inclosing a low steel plate between a mass of noncarbonaceous material [sand] on one side and a mass of granular carbonaceous material firmly packed upon the other side . . . .

Id. at 167. The Court held:

> The brick box containing the carbonaceous material prevented the same from reaching the back and sides of the plates, thus *accomplishing the same result as with the [omitted] sand* which was used to protect the back of the plate from the carbonaceous material and excessive heat as aforesaid . . . . [emphasis added]

Id. at 171.

The inquiry turns on the role of the omitted element on the overall invention. When the omitted element is important to the working of the invention as a whole, its omission avoids infringement. See *Railway Co. v. Sayles*, 97 U.S. (7 Otto) 554, 562 (1878), where the accused device lacked an element which was a "marked feature" of the invention, "and one on which stress is laid in the original application"; and *Knapp v. Morss*, 150 U.S. at 229-30, in which the accused device was missing "sliding blocks" and "rests", two of the five elements of the claim, and was held not to infringe. The *Knapp* Court stated, however, that

> If the Hall patent was a valid pioneer invention, the doctrine of equivalents might be invoked with regard to the sliding blocks and rests, and thus a different question would be raised . . . .

Id. at 230.

The lower courts continued to apply this fundamental principle, viewing the whole invention and determining the

effect of the omission or other modification. For example, in *American Stainless Steel Co. v. Ludlum Steel Co.*, 290 F. 103, 109 (2d Cir. 1923), the circuit court said:

> It was held below, and has not been here successfully disputed, that, omitting silicon, defendant has produced stainless steel; with the silicon added, it has also produced stainless steel; therefore, in respect of infringement, the silicon is *immaterial*, no matter how beneficial it may be. [emphasis added]

See also Cincinatti Car Co. v. New York Rapid Transit Corp., 35 F.2d 679, 682 (2d Cir. 1929) ("We do not forget that claims one, three and five each contemplate two sockets and that the defendant has only one").

Trial courts continue to discern the logic, as well as the justice, in this approach to equivalency. In *Simmons Fastener Corp. v. Illinois Tool Works, Inc.*, 663 F. Supp. 697, 705 (N.D.N.Y. 1987), the district court stated:

> The court can envision instances, though, where one or a number of elements of an alleged infringing device are not equivalent to elements in the claim or claims of a patented device, and a conclusion of infringement under the doctrine of equivalents can still be made. This result is also logical, because if the elements of the alleged infringing device that are not equivalent to elements in the patent are not crucial to how the device performs, or the result that it obtains, then the device as a whole could still perform substantially the same function in substantially the same way to obtain the same result as the patented device.

Similarly, expanding one element into two, or combining two elements into one, does not preclude application of the doctrine of equivalents. The solidity of this precedent was referred to by Judge L. Hand in *Royal Typewriter Co. v. Remington Rand, Inc.*, 168 F.2d 691, 693, 77 USPQ 517, 519 (2d Cir.), *cert. denied*, 335 U.S. 825 (1948):

> [A]lthough we are chary of all objective absolutes in the field of patents, reliance upon which has done more to

> conceal and confuse the subject than anything else, courts have with curious unanimity held that it does not avoid infringement to combine into one member that which the patent discloses as two, if the single member performs the duties of both in the same way. The decisions are so numerous that we confine ourselves to citing those with over the last thirty years we have passed ourselves. [citations omitted]

See also, e.g., Apex Electrical Mfg. Co. v. Maytag Co., 122 F.2d 182, 187, 50 USPQ 90, 94 (7th Cir.), *cert. denied*, 314 U.S. 687 (1941) ("Patents are not limited to the structure described and shown, but the invention may be embodied in various forms . . . . Infringment is not avoided by combining two elements of a claim in one part"); *Specialty Equipment & Mach. Corp. v. Zell Motor Car Co.*, 193 F.2d 515, 518, 92 USPQ 84, 87 (4th Cir. 1952) ("one using the substance and essentials of a patented combination does not avoid infringement by varying nonessential details. Neither the joinder of different elements of a patented combination into one, nor the separation of one integral part into two or more doing together substantially what was done by the single element will evade a charge of infringement"); *No-Joint Concrete Pipe Co. v. Hanson*, 344 F.2d 13, 15, 144 USPQ 519, 520 (9th Cir.), *cert. denied*, 382 U.S. 843 (1965) ("A substantial body of law recognizes that infringement is not avoided by making into one part that which has been shown as two"); *Magrath v. Draper Corp.*, 384 F.2d 672, 674, 155 USPQ 609, 610 (1st Cir. 1967) ("If unification or combination be regarded as omitting something, it is not enough to omit an element when the omission 'is attended by a corresponding omission of the function performed by that element * * * if the elements retained performed the same function as before' ") (quoting *Richards v. Chase Elevator*, 159 U.S. 477, 486 (1895)).

G

Graver Tank is the Culmination of this Extensive Precedent.

The last word, in a century of consideration, analysis, and application of the doctrine of equivalents, reposes in *Graver*

Tank & Mfg. Co. v. Linde Air Products Co., 339 U.S. 605, 85 USPQ 328 (1950).

In *Graver Tank* the Supreme Court reviewed its precedent, and reaffirmed the guidelines of the past. The Court, quoting from its opinion in *Sanitary Refrigerator Co.*, reiterated that

> a patentee may invoke this doctrine to proceed against the producer of a device "if it performs substantially the same function in substantially the same way to obtain the same result."

339 U.S. at 608. The Court explained that:

> One who seeks to pirate an invention, like one who seeks to pirate a copyrighted book or play, may be expected to introduce minor variations to conceal and shelter the piracy. Outright and forthright duplication is a dull and very rare type of infringement.

Id. at 607. The Court made clear that there may be circumstances when the doctrine should be applied to combinations of old elements, as discussed *ante*, and drew no distinction between application of the doctrine of equivalents directly or in "reverse":

> [The doctrine] is sometimes used against [the patentee]. Thus, where a device is so far changed in principle from a patented article that it performs the same or similar function in a substantially different way, but nevertheless falls within the literal words of the claim, the doctrine of equivalents may be used to restrict the claim and defeat the patentee's action for infringement.

Id. at 608-09. The Court's body of precedent shows unfailingly that the equitable view of an invention must be as a whole, in order to ascertain its scope and purpose, and the context in which to place the accused device.[8] This requirement is a

---

8. Note that the so-called "reverse" doctrine can *only* be applied to the invention viewed as a whole, since by definition all of the elements of the claim

consistent prerequisite to serving the interest of justice.

The *Graver* Court rejected the retrenchment urged upon it (see Part IV, *post*) and held that:

> Equivalence, in the patent law, is not the prisoner of a formula . . . .

Id. at 609. The Pennwalt majority's ruling that "the district court correctly relied on an element-by-element comparison to conclude that there was no infringement under the doctrine of equivalents", slip op. at 9, is antithetical to the requirements of *Graver Tank* and the solid precedent on which it rests.

The formula with with the majority now seeks to imprison the doctrine defies this mass of precedent. The Supreme Court consistently and expressly rejected the principle adopted by the majority, and declined to restrain the equitable authority of the courts. The purpose of the doctrine to avoid a "fraud on the patent", and our public responsibility, are ill served by the majority's cavalier restatement of the law.

III

FEDERAL CIRCUIT DECISIONS

Although this court can, *in banc*, overrule its past decisions, the majority denies that anything is being changed. I view with concern the dramatic changes, in both the law and our judicial authority, made *sub silentio* by this court.

A

This court's equitable responsibility should not be abdicated.

The Supreme Court has often reminded the judiciary, and the nation, of the importance of the equitable powers of courts:

NOTES *(Continued)*

are literally present in the accused device, and the issue is whether the device as a whole is so far changed that it nevertheless avoids infringement.

> Congress took care to arm the courts with full equitable powers. For it is the historic purpose of equity to "secur[e] complete justice"

Albemarle Paper Co. v. Moody, 422 U.S. 405, 418 (1975) (quoting *Brown v. Swann*, 35 U.S. (10 Pet.) 497, 503 (1836), and citing *Porter v. Warner Holding Co.*, 328 U.S. 395, 397-98 (1946)).

The doctrine of equivalents fulfills this equitable purpose by requiring courts to look to the invention secured by the patent and, if the technological facts warrant, to depart, in the interest of justice, from the rigorous requirements of literal infringement.

Equitable powers entrain responsibility. The Federal Circuit, over the five years of its existence, accepted this responsibility. In *Kinzenbaw v. Deere & Co.*, 741 F.2d 383, 389, 222 USPQ 929, 933 (Fed. Cir. 1984), *cert. denied*, 470 U.S. 1004 (1985), we stated our recognition of the principle that:

> The doctrine of equivalents is designed to protect inventors from unscrupulous copyists . . . and unanticipated equivalents.

In *Loctite Corp. v. Ultraseal Ltd.*, 781 F.2d 861, 870, 228 USPQ 90, 96 (Fed. Cir. 1985), we reiterated:

> The doctine has been "judicially devised to do equity" in situations where there is no literal infringement but liability is nevertheless apropriate to prevent what is in essence a pirating of the patentee's invention. (quoting *Hughes Aircraft*, 717 F.2d at 1361, 219 USPQ at 480)

The doctrine can not, by its nature, be reduced to rigid rules. Determination of equivalency is not unlike determination of substantial similarity in copyright law or determination of nonobviousness in patent law. Such determinations require judicial wisdom, not a catalog of narrow rules. The avoidance of rules has not been accidental; to the contrary, it is fundamental to the operation of the doctrine and to the authority of the courts to reach a just result.

The Court in *Graver Tank* preserved the doctrine of equivalents from becoming "the prisoner of a formula", for unnecessary rules diminish the courts' equitable authority. Until today, the courts considered the imposition of such rules to be "impossible":

> It is obviously impossible to set any theoretic limits to such a doctrine, which indeed its origin forbids, since it is in misericordiam to relieve those who have failed to express their complete meaning. . . . The usual ritual, which is so often repeated and which has so little meaning, that the same result must follow by substantialy the same means, does not help much in application; it is no more than a way of stating the problem.

Claude Neon Lights, Inc. v. E. Machlett & Sons, 36 F.2d 574, 576, 3 USPQ 220, 222 (2d Cir. 1929) (L. Hand, J.), *cert. denied*, 281 U.S. 741 (1930).

The effective application of the doctrine depends on the wisdom of the judges who are charged with this responsibility. When properly exercised, the judge-made doctrine of equivalents helps to fulfill the Constitutional mandate "to secure to authors and inventors the exclusive rights to their writings and discoveries." Art. I, §8.

B

Decisions of the Federal Circuit and its Predecessor Courts have been Fully Consistent with Supreme Court Precedent.

This court's decisions fall smoothly into the categories of the past. No new ground has been broken. This court has conscientiously, and often eloquently, reaffirmed and applied the principles that bind us.

The court has, as indeed it must, continued to review issues of equivalency in the context of the devices (or processes, or compositions) viewed as a whole. The range of equivalents that is available in a particular case depends, of course, on the specific facts. Implicit has been the awareness of how the

modified device related to the patentee's invention, viewed as a whole. This judicial constancy is well illustrated in our decisions:

In *Martin v. Barber*, 755 F.2d 1564, 225 USPQ 233 (Fed. Cir. 1985) the claims were to a combination of elements which together comprised an ankle-holding device for supporting a person in an inverted position. This court stated:

> To determine whether the Backswing [the accused device] and the claimed invention are equivalent, the fact finder must decide whether the components of the ankle-holding portion of the Backswing, *viewed as a whole*, operate in substantially the same way, and have substantially the same function and result, as the claimed invention. [emphasis added]

Id. at 1568, 225 USPQ at 235.

In *Great Northern Corp. v. Davis Core & Pad Co., Inc.*, 782 F.2d 159, 165, 228 USPQ 356, 350 (Fed. Cirl 1986), the court said, citing *Graver Tank* and *Hughes Aircraft:*

> A *device* that performs substantially the same function in substantially the same way to obtain the same result as *the patentee's product* may be treated as an equivalent of what is claimed . . . . [emphases added]

and found that a "construction of the claims . . . broader than their literal meaning" was not barred by the prosecution history. *Id.* at 166, 288 USPQ at 359.

In *Caterpillar Tractor Co. v. Berco, S.P.A.*, 714 F.2d 1110, 1115 n.2, 219 USPQ 185, 188 n.2 (Fed. Cir. 1983), the court said:

> The matter is not one for semantic antics alone. An infringer appropriates *an invention*, not words. Hence the doctrine of equivalents. [emphasis added]

In *Moeller v. Ionetics, Inc.*, 794 F.2d 653, 658, 229 USPQ 992, 995 (Fed. Cir. 1986), this court again viewed the invention in its entirety, stating:

> If the accused *device* and claimed *invention* perform substantially the same function in substantially the same way to

> give substantially the same result, there is equivalence. [emphasis added]

The *Moeller* court referred to its afirmation in *Loctite Corp. v. Ultraseal Ltd.*, 781 F.2d 861, 871 n.7, 228 USPQ 90, 96 n.7 (Fed. Cir. 1985) of "the need to [be] . . . 'guided by equitable and public policy principles underlying the doctrines [of equivalence and prosecution history estoppel] involved and by the facts of the particular case.' " *Moeller*, 794 F.2d at 659, 229 USPQ at 996. In *Loctite* this court had remanded for redetermination of infringement by equivalency in view of the overall function of the invention.

In *Amstar Corp. v. Envirotech Corp.*, 730 F.2d 1476, 221 USPQ 649 (Fed. Cir.), *cert. denied*, 469 U.S. 924 (1984), this court held that three of the asserted claims were literally infringed, and that the modified *products*, viewed by the court in their entirety,

> are the same, they perform the same function in the same way, and they achieve, as the district court found, the same result as *the claimed inventions*. *See Sanitary Refrigerator Co. v. Winters*, 280 U.S. 30, 41-42, 3 USPQ 40, 44 (1929). [emphasis added]

730 F.2d at 1483, 221 USPQ at 654. In *Amstar* the appellant argued tht the presence in the accused devices of *additional* elements, beyond those claimed, would avoid infringement; to which this court responded, "It is not the law that each element of Envirotech's accused process and product, or an equivalent of each element, must be found in the claims", and stated that only the absence of claimed elements is "relevant". *Id.* at 1484, 221 USPQ at 655. This principle is also stated in *Radio Steel & Mfg. Co. v. MTD Products, Inc.*, 731 F.2d 840, 847-848, 221 USPQ 657, 663-664 (Fed. Cir.), *cert. denied*, 469 U.S. 831 (1984), relied upon by the majority.

There is nothing in either *Amstar* or *Radio Steel* that supports the majority's new rule of inflexible one-to-one correspondence between every functional aspect of the claims and an accused device. This court iterated in *Atlas Powder*, 750 F.2d at

1579, 224 USPQ at 416, that the determination of equivalency is not "the prisoner of a formula", quoting *Graver Tank*. In *Medtronic, Inc., v. Cardiac Pacemakers, Inc.*, 721 F.2d 1563, 1567, 220 USPQ 97, 101, the court said: "Though applicable elsewhere, e.g. in determining infringement under the doctrine of equivalents, there is no legally recognized 'essence' of the invention applicable in determining validity". This court had consistently followed the Supreme Court instruction to look through the form of the claims to the substance of the invention when reviewing assertions of equivalency.

In *Hughes Aircraft*, 717 F.2d at 1364, 219 USPQ at 482, the court remarked on the "striking overall similarities between Williams' claimed satellite and the [accused] spacecraft", and held that the change in the accused device was a mere "partial variation in technique". The court held that the functions of Williams' three claim clauses (e), (f), and (g), although omitted in the accused device, were equivalent to the consolidated and improved function performed in the accused device, viewed in the context of the invention as a whole. The court said:

> The failure to apply the doctrine of equivalents to the claimed *invention as a whole*, and the accompanying demand for "obvious and exact" equivalents of two elements the presence of which would have effectively produced literal infringement, was error. [emphasis added]

Id. at 1364, 219 USPQ at 482. The court emphasized that the omitted functions must be viewed in a way that reflects their actual role in the invention, and must not be so narrowly qualified that it is impossible to cover authentic technological equivalents.[9]

In *Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 900, 221 USPQ 669, 678 (Fed. Cir.), *cert. denied*, 469 U.S. 857 (1984), this court in a five-judge panel (Davis, J., dissenting

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9. I stated earlier that the *Hughes Aircraft* facts are analogous to those at bar. They are discussed in the dissenting opinion hereof, and I remark only that the fact-dependent question in the present case could easily have been reviewed on the established law. It was not necessary to rewrite the doctrine in order to decide this appeal.

on other grounds) took as established that it is the entire invention that must be considered in determining equivalency. *See also Molinaro v. Fannon/Courier Corp.*, 745 F.2d 651, 655, 223 USPQ 706, 708 (Fed. Cir. 1984) (comparing the claimed invention with the accused receivers).

In *Perkin-Elmer Corp. v. Westinghouse Electric Corp.*, 822 F.2d 1528, 1530 n.5, 3 USPQ2d 1321, 1323 n.5 (Fed. Cir. 1987), the court stated:

> Whether differences were correctly found by the district court between the accused devices and other claim clauses is irrelevant where, as here, the differences in clauses (h) and (i) are such as to cause the accused devices to operate *as wholes* in a way not substantially the same as that in which the claimed devices operate *as wholes.*" [emphases added].

In *Carman Industries, Inc. v. Wahl*, 724 F.2d 932, 220 USPQ 481 (Fed. Cir. 1983), the claim was to a combination, some elements of which were stated in functional terms. The court, viewing the invention as a whole, observed that the accused device performs the "principal" function of the invention, that "both devices operate by inducing a similar pattern of flow", and both obtain the same result. *Id.* at 942, 220 USPQ at 488-89.

This court, following the Supreme Court, has recognized that some claim elements may be more important than others, viewed in the context of the invention as a whole. In *Thomas & Betts Corp. v. Litton Systems, Inc.*, 720 F.2d 1572, 1575, 220 USPQ 1, 4 (Fed. Cir. 1983), the claim required "a pair of spaced parallel struts". In the accused device one of these struts was omitted. Although the court observed that the invention was entitled to only a narrow range of equivalents, the omission of this element was not fatal to invocation of the doctrine of equivalents:

> [T]he proposition that the claims, taken in view of the specification, measure the metes and bounds of the invention has been realistically tempered by the judicially-formulated doctrine of equivalents.

Id. at 1579, 220 USPQ at 6.

When "essential" elements were omitted, this court (and its predecessors) held that the devices as a whole did not function in substantially the same way, and therefore there was not infringement. In *Autogiro Co. of America v. United States*, 348 F.2d 391, 403, 155 USPQ 697, 704-705 (Ct. Cl. 1967) the Court of Claims stated the classic test for equivalency:

> a structure infringes, without there being literal overlap, if it performs substantially the same function in substantially the same way and for substantially the same purpose as the claims set forth[,]

and also considered "a combination claim containing several elements, each considered to be *essential and equal* to all others" [emphasis added]. The court held that: "For there to be infringement, it is necessary that every element or its substantial equivalent be found in the accused structures." *Id.* at 403, 155 USPQ at 707. In *Lemelson v. United States*, 752 F.2d 1538, 1551, 224 USPQ 526, 533 (Fed. Cir. 1985) the court stated that each element of a claim is "material and essential", and held that the essential "manipulation means" in the patented combination was absent in the accused device, with no substantial equivalent therefor. In *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 221 USPQ 929 (Fed. Cir. 1984), the court based its decision on the assumption that the omission of the claimed function changed the way the device as a whole worked:

> We infer that the district court *necessarily* found that the Wells device, lacking the claimed function of overriding a locked key switch, does not function in substantially the same way as *the claimed invention*. [emphases added]

Id. at 1582, 221 USPQ at 936.

Whether an element is essential is determined with the guidance of the prosecution history and the prior art. In *Chemical Engineering Corp. v. Essef Industries, Inc.*, 795 F.2d 1565, 1572-73, 230 USPQ 385, 390-91 (Fed. Cir. 1986), this court held:

> Concerning infringement under the doctrine of equivalents, the district court correctly noted that the prosecution history of the McLean patent established that raising the pH in the specific manner claimed was *crucial to patentability* of McLean's invention, rendering a device that did not raise pH, as is here undisputed, one that did not function in substantially the same way. [emphasis added]

See also Stewart-Warner Corp. v. City of Pontiac, Michigan, 767 F.2d 1563, 1571-72, 226 USPQ 676, 681-82 (Fed. Cir. 1985); *Builders Concrete, Inc. v. Bremerton Concrete Products Co.*, 757 F.2d 255, 225 USPQ 240 (Fed. Cir. 1985).

None of this jurisprudence supports the majority's ruling that every functional aspect of a claim is necessarily an essential limitation, such that if omitted there can be no infringement based on equivalence. The requirement that every part of a "function" must be discretely performed in an accused device, one-to-one, whatever its significance to the invention as a whole, is contrary to the overwhelming body of precedent.

IV

THE TENSION BETWEEN THE DOCTRINE OF EQUIVALENTS AND PRECISION CLAIMING IS NOT A NEW IDEA

The Supreme Court has, at least since 1857, remarked on the conflict between the uncertainty inherent in the doctrine of equivalents and the principle that the claim defines the patent right. As discussed in the dissent hereof, this tension has been recognized throughout the history of the doctrine. See, for example, the dissenting opinion in *Winans v. Denmead*, quoted *supra*, and Judge L. Hand's comment in *Clause Neon Lights*, 36 F.2d at 575, 3 USPQ at 221-22:

> The doctrine of equivalents, though well settled for many years, is anomalous, if the claim is measured only by its words. . . .
>
> It is plain that such latitude violates in theory the underlying and necessary principle that the disclosure is

> open to the public save as the claim forbids, and that it is the claim and that alone which measures the monopoly . . . . The vacillation in the decisions is a necessary consequence of this inconsistency in theory. . . .

The issue was directly confronted in *Graver Tank* 339 U.S. 605, on rehearing (and rebriefing) the sole issue of the doctrine of equivalents. The *Graver Tank* majority decided in favor of equity, stating that

> to permit imitation of a patented invention which does not copy every literal detail would be to convert the protection of the patent grant into a hollow and useless thing.

339 U.S. at 607. The dissent in *Grover Tank* stated the position adopted by the majority today: that patent claims should be strictly construed. The issue was resolved. It is not available for reversal by this court.

It is not available to this court to decide that the doctrine of equivalents can not apply to the invention viewed as a whole. In *Paper Converting Machine Co. v. Magna-Graphics Corp.*, 745 F.2d 11, 19, 223 USPQ 591, 596 (Fed. Cir. 1984) (Nies, J., dissenting), the court remarked that "the dissent's argument is based on the utopian belief that a copier 'should be able to look to the patent claims and know whether his (or her) activity infringes or not' ". The court wrote:

> Although this may be a desirable goal for the patent laws, it is *not* the law as it exists. In particular, the doctrine of equivalents has been judicially created to ensure that a patentee can receive full protection for his or her patented ideas by making it difficult for a copier to maneuver around a patent's claims. [emphasis in original]

Id. This court rejected the imposition of a "bright-line test" that would have denied judicial equitable authority.

The vitality of the doctrine of equivalents has been tested and reaffirmed for a hundred years. At its best, it is a guardian of justice and an enemy of fraud. The dramatic consequences forecast in dissent have not occurred, perhaps because the

doctrine depends for its implementation on judicial wisdom. The keeping of that wisdom was entrusted to us.

The position expressed in dissent in *Paper Converting*, and in support of the majority here, was rejected by the Supreme Court in *Graver Tank* and, a century earlier, in *Winans*. Whatever one's personal beliefs on the matter, this court has exceeded its mandate when it bases its decision on a dissent of the Supreme Court. As was stated in *Paper Converting*, "it is not the law".

United States Court of Appeals for the Federal Circuit

ERRATA

November 17, 1987

PENNWALT CORPORATION,	:	
	:	
v.	:	Appeal Nos. 85-1882
	:	and 85-1933.
DURAND-WAYLAND, INC.,	:	

Decided: November 6, 1987 — Published

NIES, *Circuit Judge*, additional views.

Please make the following changes:

Page 3, last line of first block quote, after "equivalents)." insert:

— This rule is frequently applied by the courts to so-called "combination" claims. However, the rule in fact is a universal one of claim drafting and construction.

Page 14, last line, after "due process." insert:

— It would also run counter to the specific limitations and protections of 35 U.S.C. §§251 and 252 (1982) with respect to broadening claims after issuance.—

District Court, N. D. Georgia,
Newnan Div.

Pennwalt Corporation
v. Durand-Wayland, Inc.

No. C80-114N
Decided Mar. 22, 1984

PATENTS

1. Specification — Sufficiency of disclosure (§62.7)

Inventor is required to fully describe what he claims as his invention, but is not required to fully describe those parts that are not claimed as invention if those portions not claimed as invention are within common knowledge of persons skilled in particular art.

Particular patents — Fruit Sorter

4,106,628, Warkentin and Mills, Sorter for Fruit and the Like, valid but not infringed.

Action by Pennwalt Corporation, against Durand-Wayland, Inc., for patent infringement. Judgment for defendant.

Tidwell, District Judge.

Plaintiff, Pennwalt Corporation ("Pennwalt"), is a Pennsylvania corporation having a principal place of business in Philadelphia, Pennsylvania. Pennwalt filed the above-styled patent infringement action on September 26, 1980, alleging that it is the owner of United States Patent No. 4,106,628 (hereinafter referred to as "the patent" or "the patent-in-suit") and that the defendant, Durand-Wayland, Inc. ("Durand-Wayland"), has been and is now infringing upon the patent by its marketing of certain fruit sorting machines. Durand-Wayland is a Georgia corporation having its principal place of business in LaGrange, Georgia. In its amended answer, Durand-Wayland attacked the validity of the patent, denied infringement, and alleged several

counterclaims, but the parties and the court agreed that Pennwalt's contentions of patent validity and patent infringement should be tried before any other issues in this case are allowed to proceed.

After an extended discovery period, this action was set for trial on the validity and infringement issues. A trial on these two issues was conducted on the following days: February 28- March 5, 1983; March 29-31, 1983; April 26-29, 1983; and October 11-13, 1983. Shortly after the trial began, the court determined that a court-appointed expert would be both helpful and necessary in the adjudication of the extremely technical issues raised in this patent action. Therefore, Dr. Andre G. Vacroux, Dean of the College of Engineering at the Illinois Institute of Technology in Chicago, Illinois, was retained as the court-appointed expert. Rule 706, Fed.R.Evid. At the conclusion of the trial, a briefing schedule was agreed upon, thereby allowing both parties the opportunity to submit their legal analyses of the case to the court. Inasmuch as the briefing schedule has been concluded, this action is ripe for disposition on the merits.

On the first day of trial (February 28, 1983), the court ruled that Pennwalt's chain of title to the patent was not impaired in any way and that Pennwalt does in fact have good title to the patent-in-suit. The following opinion will constitute this court's "findings of fact" and "conclusions of law" pursuant to Rule 52(a), Fed. R. Civ. P., on the issue of whether the patent-in-suit is valid and on the issue of whether the machines marketed by Durand-Wayland infringe the patent-in-suit.

The Patented Invention

The patent-in-suit describes a high speed machine that is able to electronically determine the weight and color of fruit (the machine is capable of sorting a wide variety of items, but for clarity the court will refer to "fruit" as the item(s) to be sorted.) The machine is capable of sorting a piece of fruit into one of several combined weight and color categories in a single sorting operation. The machine does this by using a color sensor and a

weight sensor to produce electrical signals representative of the color and the weight, and these two signals are processed to yield a combined weight/color signal which is used to sort the fruit downstream of the color and weight sensors.

Fruit is delivered from a storage bin onto a belt conveyor and then to a rollover conveyor, called a singulator, which aligns the fruit into several single-file lanes. The singulator transports the fruit beneath an optical detection device, or "color head," which is comprised of a number of light sources arranged to illuminate the fruit and a number of light detectors arranged to measure the intensity of light reflected from the fruit. The intensity of the reflected light varies according to the color of the fruit. The optical detection device produces a signal that is proportional to the color of the piece of fruit passing beneath it.

The signal from the optical detection device is amplified and then processed by electrical circuitry to provide a digital "word" indicative of the piece of fruit's color. This process is performed by comparing the particular signal from the optical detection device to certain color reference signals set by the machine's operator. The color reference signals represent the parameters between each color grade and are set according to the color grades desired by the operator.

After the fruit has been transported beneath the optical detection device, it is discharged from the singulator into one of a series of cups arranged along a continuous belt. This cup conveyor is driven so that it moves in synchronism with the singulator. The cup conveyor transports each cup (with a piece of fruit inside it) to a weight station located downstream from the optical detection device. The weighting station consists of an electronic scale incorporated into a portion of the cup conveyor track. The weighing station is beneath the path of the cups, so that the cup can be weighed while it is in motion and in transit over the electronic scale. This scale provides a weight signal that is proportional to the combined weight of the cup and fruit. The weight signal is then processed by electrical circuitry to provide a digital "word" indicative of the weight of the cup and fruit. This is performed by comparing the weight signal to predetermined weight reference signals set by the machine's operator.

The weight reference signals represent parameters between each weight grade and are set according to the weight grades desired by the operator.

A shaft encoder, driven by the cup conveyor chain, generates a pulse every time the cups on the conveyor belt and the pockets in the singulator have moved a predetermined distance. As a piece of fruit is transported from the optical detection device to the electronic scale, an electronic circuit stores the color grade data for that piece of fruit. The particular electronic circuit shown in the patent-in-suit is a shift register. The shift register has a number of sequential stages equal to the combined number of pockets and cups between the optical detection device and the electronic scale, and each stage in the shift register stores color grade data for a particular piece of fruit in transit from the optical detection means to the electronic scale. The shift register is responsive to the pulses generated by the shaft encoder so that the color grade data is shifted one stage for each pulse received from the shaft encoder. As soon as a piece of fruit reaches the weighing station, its corresponding color grade data is shifted out of the last stage of the shift register and is made available to the processing circuitry. This processing circuitry combines the color grade data with the weight grade data for the purpose of determining which of a plurality of drop locations should receive the fruit.

The determination of the particular drop location for a piece of fruit is based on the combined color and weight of the fruit, and the particular inputs selected by the operator for fruit of this color and weight grade. The drop locations for the fruit are arranged serially downstream from the electronic scale, and each drop location is signified by a gap in the cup conveyor track. The gap is normally filled by a solenoid-actuated pin, so that when the pin is in its normal position the cup rides over the gap without falling. However, when the pin is retracted by solenoid action, the cup is allowed to tilt downward and the fruit is discharged at that particular drop location.

The determination of which location to drop each piece of fruit is stored in an electronic circuit. The patent indicates that the electronic circuit is comprised of a plurality of shift registers,

with one shift register assigned to each drop location. The length of each shift register corresponds to the number of cups from the electronic scale to its associated drop location. A digital "1" is entered into the appropriate shift register by the processing circuitry depending upon the location where the fruit is to be discharged. All other shift registers receive a digital "0". When a "1" is shifted out of the last stage of any shift register, the corresponding discharge mechanism is activiated.

Therefore, the machine is able to sort into many categories based on two criteria, weight and color. The machine uses two position indicating circuits: the first position indicating circuit continuously keeps track of the fruit as it is in transit from the optical detection device to the electronic scale, and the second position indicating circuit continuously keeps track of the fruit as it is in transit from the electronic scale to the drop locations. The color and weight signals are processed and combined until it has reached its final destination. The patent provides for a machine that, in one operation, sorts fruit by weight and color at high speed and with a high degree of accuracy.

The Durand-Wayland Machines

Durand-Wayland manufactures and sells two different types of automatic fruit sorting machines, both of which Pennwalt alleges infringe upon the patent-in-suit. One machine sorts fruit by weight only and is called the "Microsizer," whereas the other machine sorts fruit by both weight and color. The machine that sorts according to both weight and color consists of a "Microsizer" operating in conjunction with a "Microsorter," an apparatus concerned with the detection of reflected light from a piece of fruit. A "Microsizer," without a "Microsorter" apparatus, contains software labelled either Version 2 or Version 5, and no machine using either Version 2 or 5 software has ever been able to sort fruit according to color. The first software version able to sort according to color was Version 6 to be used on a "Microsizer" with a "Microsorter" apparatus.

The "Microsizer" consists of a cup conveyor for transporting the items to be sorted, with each cup to carry a single piece of fruit. A strain guage weight scale is used for weighing the item and the cup, and this scale is in the path of travel of the cups so that the cups can be weighed while in motion. The "Microsizer" has a microprocessor or central processing unit ("CPU") which uses either Version 2 or 5 software to control the operation of the machine. The structure of the "Microsizer" also includes a shaft encoder as well as solenoids to operate the drop mechanism for discharging a piece of fruit. The major hardware control elements of a "Microsizer" having either Version 2 or 5 software are the CPU card, a random access memory ("RAM"), program storage, an encoder, analog to digital converters and relays interfaced with the drop solenoids.

The "Microsizer" that includes the "Microsorter" consists of a singulator for carrying fruit under a prior of "color heads" (which are found within the "Microsorter"). As a piece of fruit passes under, one "color head" receives light reflected from the left top of the fruit and the other "color head" receives light reflected from the right top of the fruit. A cup conveyor then receives the piece of fruit from the singulator. The fruit is weighed (in the same manner as described above) and is then discharged by the operation of a solenoid.

The hardware components of the "Microsorter," the color sensing portion of the Durand-Wayland machine, include: the light sensors; an analog to digital converter; a microprocessor called GPU 1; and an encoder. The major hardware components of GPU 1 are a Z-80 market computer card, a RAM board and an input/output ("I/O") board. CPU 1 is loaded with software labelled Version 3, and its function is to gather information regarding the amount of light reflected off a piece of fruit. The encoder allows CPU 1 to sample the reflected light along different parts of the fruit. The "Microsorter" itself contains no means for determining the color grade of an item, but rather the "Microsizer" (one capable of sorting by weight and color) makes this determination.

The other hardware components of the "Microsizer" that includes the "Microsorter" are: the weight scale; an analog to

digital converter; a second microprocessor called CPU 2; and three photoeyes and relays connected to the solenoids. The major hardware components of CPU 2 are a Z-80 microprocessor computer card, a RAM card and I/O ports. CPU 2 takes the information from the weight scales and the color information from CPU 1 and determines where to drop the fruit. CPU 2 is loaded with software labelled Version 6 to control the operation of this "Microsizer."

Development of the Patented Invention

The patented invention was developed during the period from December 1974, to August 1975. Prior to and during development of the patented invention, Aaron J. Warkentin, one of the co-inventors, was the president of Tilt-Belt Systems, Inc. ("Tilt-Belt"), a California corporation engaged in the business of manufacturing new equipment for, and reselling used equipment to, the fruit and vegetable packing industry. Warkentin had considerable experience as a farmer and as a packer of fruit, and prior to designing the machine described in patent-in-suit, he had designed other machinery used in the fruit packing industry.

George Mills, the other co-inventor, had been employed by Sunkist Growers, Inc. ("Sunkist") from 1968 to April 1970, and his primary responsibility was to design the optical portions of Sunkist's X-ray grader that determined internal damage to citrus fruits. He also worked on the optics for a blemish scanner, but the record indicates that the optics of these machines were not designed either to weigh fruit or to determine the color of a piece of fruit. After he left full-time employment at Sunkist on April 1, 1970, Mills became a part-time consultant to Sunkist. Mills worked on his own farm in addition to his consulting work for Sunkist, and during the period of time Mills worked as a consultant, he did not have access as to what was going on at Sunkist on a daily basis. Mills was a consultant to Sunkist from April of 1970 to October 31, 1974.

None of the work done by Mills while he was an employee of or a consultant to Sunkist involved sorting fruit by weight or color. As a consultant, Mills worked primarily on a machine designed to imprint Sunkist's trademark on citrus fruit, as well as additional work on "dirtfree" optics for a blemish detector, and "paper" design work on a laser scanner.

Mills and Warkentin apparently met for the first time in June 1974. Mills had been asked by Mr. David Cairns of Cairns Orchards in Lemon Cove, California, to examine an automatic accounting system for a box packaging machine with which Cairns Orchards was having problems. Mr. Cairns was a customer of Tilt-Belt and a friend of Warkentin, and introduced Warkentin to Mills in June 1974. In August of 1974 on behalf of Tilt-Belt, Warkentin retained Mills to design a box packer for cantaloupes. Mills' consulting agreement with Sunkist was exclusive only as to "citrus and tree fruit" and since cantaloupes grow on vines and are not citrus fruit, this work did not violate Mills' consulting agreement with Sunkist.

Following the termination of Mills' consulting agreement with Sunkist on October 31, 1974, Warkentin disclosed to Mills his ideas about an electronic sizing machine utilizing a load cell. Warkentin and Mills did not start work on Warkentin's idea for electronically sorting fruit by weight and color until after the expiration of Mills' last Sunkist consulting agreement. The first attempt at making an electronic fruit sorting apparatus was made in December 1974 and this attempt involved modifications to a used FMC Corporation ("FMC") mechanical weight sizer Warkentin had in stock at Tilt-Belt. In 1974, Tilt-Belt was a dealer for FMC agricultural machines, including both new and used FMC mechanical weight sizers. The modifications Warkentin and Mills made to the FMC machine established the feasibility of electronic weighing of fruit, but this modified machine never properly sorted and discharged fruit according to weight.

Although Princess Orchards placed an order for an electronic weight sizer with Tilt-Belt on February 20, 1975, there was no sorter in existence at that time. Earl Follett, who placed the order on behalf of Princess Orchards, saw no sorter, was told that no electronic weight sorter had yet been constructed and

payment for the machine was conditional on its successful construction and operation. The court finds and concludes that there was no offer for sale prior to February 20, 1973, and that no weight sorting machine, as described in the patent-in-suit, existed until the first weight sorter was installed at Princess Orchards in June 1973.

After receipt of Princess Orchard's order, Warkentin and Mills commenced construction of a machine capable of sorting by weight. Both Warkentin and Mills made inventive contributions to the invention claimed in the patent-in-suit. Warkentin contributed the concept of combined color and weight sorting in a single operation as well as developing the mechanical aspects of the invention. Mills contributed to the weight and color processing circuitry and to the color sorting scheme. Warkentin and Mills worked together in the development of the machine described in the patent-in-suit, and the invention was their joint effort.

Prior Art Considered by the Patent Office

The following United States Patents were cited or considered by the Patent Examiner in the Patent and Trademark Office who analyzed the patent application that matured into the patent-in-suit:

Patient No.	Issue Date	Inventors
2,980,252	4/1961	Bray et al.
3,066,797	12/1962	Fraenkel
3,070,227	12/1962	Larew et al.
3,192,535	6/1965	Watson
3,206,022	9/1965	Roberts et al.
3,270,880	9/1966	Brian et al.
3,289,832	12/1966	Ramsay
3,353,015	11/1967	Cervin
3,750,883	8/1973	Irving et al.
3,773,172	11/1973	McClure et al.
3,901,334	8/1973	Rose

The Larew patent discloses an apparatus for inspecting sheet metal for pin holes and other flaws. Flaw sensors scan the metal sheet as it passes an inspection station, and upon detecting a flaw, a flow sensor generates a digital bit which is put into one of two shift registers. The bit is shifted through the shift register in synchronism with the movement of the metal, and this bit is stored in a separate memory device until such time as the defective sheet reaches the reject station. The Larew apparatus rejects defective sheets for any flaw, and the machine has only one discharge location.

The Watson patent discloses an automatic weighing system that includes a track along which a series of individual freight cars move and an electronic weighing means in the form of a load cell incorporated into the track. The Watson device does not have any sorting capabilities.

The Roberts patent discloses a two-color optical sorter in which each of the color signals is compared to its own set of references. Apples to be sorted are placed in pockets on a conveyor, and a sorting arm (associated with each pocket) rides in a track parallel to the conveyor. When the color grade of an apple is determined, the sorting arm associated with the particular pocket carrying the apple is diverted by a sorting gate into one of three parallel grading tracks (one for each color grade). As soon as each sorting arm reaches the end of the grading track to which it has been diverted, the apple is dropped.

The Brian patent discloses an optical dimensional sizer which can be used for color sorting. An item to be sorted passes a series of light beams and their associated photocells. The item will eventually break one of the light beams and cause a "kicker" to be activated so that the item is moved onto a perpendicular takeaway conveyor. Items of the same size will break the same light beam, and therefore, similar items will be ejected onto the same takeaway conveyor. Brian does not disclose any circuitary describing how the system operates.

The Ramsay patent discloses a device for detecting flaws in tin cans. Cans are transported past a series of inspection stations where they are examined for flaws. Memories called "position indicators" signify the can position relative to an inspection

station, but these memories do not keep track of the position of the cans as they are transported between inspection stations. Defective cans are all rejected at a single location for any one of a number of defects.

The McClure patent discloses a machine for automatically sorting blueberries based on the amount of light (of a particular color) reflected off of each berry. Berries are placed in individual cups on a cup conveyor and carried past a color sensing station. The optical detection means respond to the light that is transmitted, and a signal is generated. This signal is processed to yield a binary logic signal representative of the grade of the berries. A memory means (in the form of a shift register) keeps track of the position of the berry and is clocked in synchronism with the conveyor. The berries are discharged (at one of three locations) when the binary logic signal reaches the output of the shift register and activates air jets which blow the berries from the conveyor.

The Rose patent discloses a machine for weighing eggs on an electronic scale which sequentially receives eggs from a roller conveyor. Eggs to be weighed are stopped and rest upon a plunger which operates a weighing scale. After being stopped and weighed, the eggs are transferred to a series of cups or receiving pockets on a second conveyor. Rose includes the concept of a memory for subsequent processing of weight data, but does not provide the specific details of such a memory.

Prior Art Referenced by Durand-Wayland

The following patents are relied upon by Durand-Wayland to invalidate the patent-in-suit:

U.S. Patents

Number	Date	Patentee
3,017,024	1/16/62	Mumma
3,627,127	12/14/71	Whiteford
3,640,384	2/8/72	Del Rosso
3,768,645	10/30/73	Conway et al.
3,770,111	11/6/73	Greenwood et al.
3,898,435	8/5/75	Pritchard et al.
3,917,069	11/4/75	Alexander
3,918,587	11/11/75	Drew, Jr.
3,948,765	4/6/76	Anschutz
4,024,053	5/17/77	Drew, Jr., et al.

The Mumma patent discloses an egg grading apparatus to sort eggs according to quality and weight. An operator must separate the eggs into one of eight quality grades by physically placing the eggs onto one of eight quality racks. All eight quality grades are merged into a single file line, and the eggs are then placed onto a conveyor. This conveyor moves the eggs to a scale where they are weighed, and another conveyor moves the eggs from the scale. A mechanical memory records both the quality grade and the weight grade of an egg. The memory actuates drop-off solenoids to deposit eggs at locations according to their quality and weight grade.

The Del Rosso patent discloses a machine for weighing odd-shaped articles. Items to be weighed are placed in buckets and are intermittently moved by two conveyors and two turntables. One of the two conveyors moves the item(s) in the bucket over a weighing platform, and the weight of the item(s) is recorded in a mechanical memory for sorting the items after they are weighed. The memory is synchronized with the movement of the conveyors, but the buckets are not fixed on the conveyors.

The Conway patent discloses a machine for inspecting citrus fruit for internal defects by X-raying the fruit.

The Pritchard patent discloses an electronic memory for a machine which grades eggs according to their weight. Groups of six eggs are individually weighed on electromechanical scales which directly output a signal corresponding to the weight grade for the egg on the scale, and these signals are put into a primary memory unit. The data are shifted in the memory in synchronism with the movement of the conveyor, and the output of the memory activates discharge stations for discharging the eggs at the proper packing stations.

The Alexander patent discloses various embodiments of fruit sorting machinery and suggests color and weight sorting, but this patent indicates that the fruit is first physically sorted according to one of three qualities and each quality is then individually sorted into weight grades. No details of how to accomplish the sorting are disclosed.

The two Drew patents disclose an apparatus for detecting the weight of poultry suspended from shackles and for dispensing individual birds at one of a plurality of dispensing stations along the conveyor. In the first Drew patent, a latch circuit provides a fixed time delay between the time a weight measurement is taken and the time the bird is dispensed. This permits the bird to clear the scale before dispensing. The circuitry in the first patent consists of discrete electronic parts, whereas the second patent replaces the discrete electronic parts with a microprocessor.

The Anschutz patent discloses an egg sorting apparatus which sorts eggs in accordance with one of six weight grades. Eggs are transferred from a conveyor onto a strain gauge where they are weighed. The strain gauge output is fed to comparators and then to logic circuitry. The output of the logic circuitry is a binary signal appearing on one of six parallel lines corresponding to the weight grade of the egg. Each egg is moved from the strain gauge to another conveyor. The binary signal is clocked through a shift register by one stage each time the egg moves past the discharge station. Therefore, as the machine operates, the eggs are taken from a first conveyor, removed from that conveyor and placed on a strain gauge, and then removed from the strain gauge onto a second conveyor.

Validity of the Patent-in-Suit

An issued patent enjoys a statutory presumption that it is valid. 35 U.S.C. §282 provides, in pertinent part, as follows:

> [A] patent shall be presumed valid. Each claim of a patent (whether in independent, dependent, or multiple dependent form) shall be presumed valid independently of the validity of other claims; dependent or multiple dependent claims shall be presumed valid even though dependent upon an invalid claim. The burden of establishing invalidity of a patent or any claim thereof shall rest on the party asserting such invalidity.

This statutory presumption requires the court "to employ a decisional approach that starts with acceptance of the patent claims as valid and that looks to [Durand-Wayland] for proof of the contrary." Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d 1530, 1534, 218 USPQ 871, 875 (Fed. Cir. 1983). The burden of persuasion on the merits remains with Durand-Wayland at all times, id., and the statutory presumption of validity can be overcome only by clear and convincing evidence. Astra-Sjuco A.B. v. U.S. Intern. Trade Comm., 629 F.2d 682, 688, 207 USPQ 1, 6-7 (C.C.P.A. 1980).

Were the patent's claims anticipated by prior art?

Durand-Wayland contends that the claims of the patent are anticipated, i.e., fully met, by one or more of the prior art references it raised at trial. 35 U.S.C. §102 clearly places the burden on Durand-Wayland to show that the patent-in-suit was anticipated.

> A party asserting that a patent claim is anticipated under 35 U.S.C. §102 must demonstrate, among other things, identity of invention. In cases like this, identity of invention is a question of fact, e.g., Coupe v. Royer, supra, 155 U.S. at 578-79, 15 S.Ct. at 204-05, and *one who seeks such a finding must show that each element of the claim in*

> *issue is found, either expressly described or under principles of inherency, in a single prior art reference, or that the claimed invention was previously known or embodied in a single prior art device or practice*. Preliminary to this determination, of course, is construction of the claims to determine their meaning in light of the specification and prosecution history, which construction is a matter of law for the court.

Kalman v. Kimberly-Clark Corporation, 713 F.2d 760, 771, 218 USPQ 781, 789 (Fed. Cir. 1983) (emphasis added).

In order to determine if this technical defense raised by Durand-Wayland is meritorious, the court must first construe the claims of the patent-in-suit to determine their meaning before beginning an analysis of each patent raised by the defendant as prior art.

Are the patent's claims complete?

In the patent-in-suit, Warkentin and Mills state the following:

> We claim:
>
> 1. An *automatic sorting apparatus* comprising conveyance means for transporting a plurality of items to be sorted along a track and having individual cups for transporting each said item, said individual cups being connected in a continuous belt,
>
> *electronic weighing means* incorporated into a portion of said track for generating a signal proportional to the weight of said item to be sorted.
>
> *reference signal means* for providing a predetermined number of reference signals, the value of each signal established according to a predetermined criteria,
>
> *comparison means* for comparing the signal generated by said electronic weighing means to the reference signals provided by said reference signal means,

clock means for incrementally signalling changes in position of an item to be sorted,

first position indicating means responsive to the signal from said clock means and the signal from said comparison means for generating a signal indicative of the position of the item to be sorted, and

discharge means responsive to the signal generated by said position indicating means for discharging the item to be sorted at a predetermined position.

2. The apparatus of claim 1 wherein said electronic weighing means comprises a *strain guage*.

* * *

10. An *automatic sorting apparatus* comprising *electronic weighing means* for generating

a signal proportional to the weight of an item to be sorted.

first reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria.

first comparison means for comparing the signal generated by said electronic weighing means to the reference signals provided by said first reference signals means,

optical detection means for generating a signal proportional to the color of an item to be sorted,

second reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria,

second comparisbn means for comparing the signal generated by said optical detection means to the reference signals provided by said second reference signals means, and generating a signal therefrom,

clock means for incrementally signaling changes in the position of the item to be sorted,

first position indicating means responsive to a signal from said clock means and said signal from said second comparison means for continuously indicating the position of an item to be sorted while the item is in transit between said optical detection means and said electronic weighing means,

second position indicating means responsive to the signal from said clock means, the signal from said first comparison means and said first position indicating means for generating a signal continuously indicative of the position of an item to be sorted after said item has been weighed, and

discharge means responsive to the signal from said second position indicating means for discharging the item at a predetermined one of a plurality of sorting positions.

* * *

18. An *automatic sorting apparatus* comprising *electronic weighing means* for generating

a signal proportional to the weight of an item to be sorted,

first reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria,

first comparison means for comparing the signal generated by said electronic weighing means to the reference signals provided by said first reference signal means, and generating a signal therefrom,

optical detection means for generating a signal proportional to the color of an item to be sorted,

second reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria,

second comparison means for comparing the signal generated by said optical detection means to the signals provided by said second reference signal means, and generating a signal therefrom,

clock means for incrementally signalling changes in position of the item to be sorted,

first position indicating means responsive to a signal from said clock means and the signal from a first one of said first and second comparison means for generating a signal continuously indicative of the position of an item to be sorted while the item is in transit between a first one of said optical detection means or said electronic weighing means, and the other of said optical detection means or said electronic weighing means,

second position indicating means responsive to the signal from said clock means, the signal from said first position indicating means, and the signal from the other of said first and second comparison means for generating a signal continuously indicative of the position of the item to be sorted after the item has passed the other of said optical detection means and said electronic weighing means, and

discharge means responsive to the signal from said second position indicating means for discharging the item at a predetermined one of a plurality of sorting positions.

(emphasis added).

35 U.S.C. §112 provides, inter alia, that "[t]he specification shall conclude with *one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention*." (emphasis added). This portion of the statute requires that the language chosen by an inventor for his

patent claims must clearly set forth the area over which he seeks "exclusive rights". Rengo Co. Ltd. v. Molins Machine Co., Inc., 657 F.2d 535, 551, 211 USPQ 303, 321 (3rd Cir.), cert. denied, 454 U.S. 1055 (1981). The language of the claims must clearly demarcate the boundaries of the invention so that others are put on notice as to what is claimed as the invention. The purpose of this portion of the statute is to adequately notify potential infringers of the scope and function of the claimed invention. Id.

Patent claims are to be reasonably interpreted, and the claims should be read in light of the prior art and as it would be interpreted by one possessing the ordinary level of skill in the particular art. Application of Moore, 439 F.2d 1232, 1235, 169 USPQ 236, 238-39 (C.C.P.A. 1971). Viewed in this posture, it is important to note that the record in this action indicates that not one of the expert witnesses (engineers or patent lawyers) had any significant trouble understanding the claims of the patent. Each expert seemed comfortable in his understanding of the claims, and each expert was able to analyze every claim element by element. Each expert agreed that every element set forth in the patent's claims is found in the patent's specification, even though the precise words used in the patent's specification are not necessarily used in the patent's claims. Inasmuch as the statute does not require an inventor to use the exact same words in both the specification and the claims, the court must determine whether the language used by the inventors in the patent's claims clearly and adequately set forth what is claimed as the invention, whether the language is consistent with the language used in the patent's specification, and whether the language is reasonably clear in its meaning. Rengo Co. Ltd. v. Molins Machine Co., Inc., 657 F.2d at 550-51, 211 USPQ at 320-21.

A reading of the patent's claims, the testimony of the expert witnesses, and both Dr. Vacroux's testimony and report indicate that the inventors, through their patent claims, adequately notified the world as to the scope and function of the device claimed as the invention. Since the patent's claims set forth the scope and function of the invention so that others in the art were easily able to understand the invention (Durand-Wayland had

no trouble understanding the patent's claims), the patent's claims are sufficiently definite to comply with the statute.

The court now turns to the prior art referenced by Durand-Wayland to determine whether the patent-in-suit was anticipated by the pertinent prior art. As was stated by the United States Court of Appeals for the Federal Circuit in Kalman v. Kimberly-Clark Corporation, supra, Durand-Wayland must show that each element of the patent's claims is found in a single prior art reference or that the claimed invention existed in a single prior art device.

Mumma

This machine sorts eggs according to both weight and quality grade. The quality grading is done by the human operator, and therefore, this machine does not accomplish its goal totally by electro-mechanical means. There is no second reference signal, no second comparison means and no optical detection means because this machine electro-mechanically sorts according to only one criterion. The weighing mechanism described in this device appears to be more mechanical than electrical, in that this device operates mechanically with electrical impulses used for comparison of the egg's weight to a predetermined reference signal. This device also does not have in-track weighing, but rather delivers an egg to the weighing platform on one conveyer and removes the egg with another conveyer.

Del Rosso

This machine sorts odd-shaped items (dissimilar items) according to their weight. This device does not have a track or in-track weighing, but rather places the items in buckets, moves the buckets on one conveyer to the weight platform, and after the weighing has occurred, the machine moves the buckets away on a second conveyor. This device has no clock means, no position indicating means and does not generate signals indicative of the particular bucket's locations.

Conway

This machine measures the internal damage in citrus fruit and does not weigh the fruit, does not have a weighing means and is not capable of processing a weight signal.

Pritchard

This apparatus is a memory device to be used with an egg grading machine, and it is capable of only analyzing weight data. The memory device is not designed for a machine capable of in-track weighing, but rather for a machine in which one conveyer brings the egg to the weight scale and another conveyor moves the egg away from the weight scale. Since this device is a memory device to be used with an egg grading machine, it is difficult to compare this device with the patent-in-suit because the patent-in-suit discloses how the memory works in conjunction with a sorting machine. The memory device in Pritchard teaches shift registers, clock means and other information about storing weight data, but this particular patent does not disclose a memory device capable of being used in a machine that has an electronic weighing means and/or optical detection means.

Alexander

This machine sorts hard fruit by requiring a human operator to view the fruit and inspect it for damage. This patent discloses an arrangement of mirrors capable of improving the optical inspection of fruit, and the disclosed apparatus uses a memory to keep track of the motion of the fruit. This patent suggests color and weight sorting as well as suggesting the use of a computer to combine various grading methods, but the patent does not give any details of how these ideas are to be accomplished.

Drew (two patents)

These machines sort poultry by weight; one uses discrete electrical circuitry and the other uses a microprocessor. Poultry is suspended from shackles on an overhead rail, and the poultry is weighed at a platform in the rail. There is one weighing platform for each grade to be sorted and the weighing platform

instantly determines whether the particular bird is within the desired weight parameters, and if so, the machine drops the bird as soon as it clears the weight scale. The machines do not keep account of the birds as the weighing process occurs and do not track the birds after the weighing has occurred because there is no clock means, no position indicating means and no downstream drop locations for all of the birds.

Durand-Wayland contends that Drew delivered a paper at a conference in which he described his machine and showed how his machines continued to track the birds from the weight scales to the discharge locations, if the birds were not discharged at the location of that particular weight scale. The record in this action indicates that the Drew paper that was delivered at the conference was not a "printed publication" within the meaning of §102, and the contents of the Drew paper were not available to the public until after the patent-in-suit was applied for. Thus, anything about the Drew patents outside the scope of these two patents themselves was not known to the inventors before they filed their patent application.

Although Drew also testified about an installation of a poultry machine at Marell Poultry, the evidence was insufficient to indicate what was actually installed at that site. The defendant is relying solely on the recollection of Drew and the court concludes that this is insufficient to support a finding that the Drew patents, read in conjunction with Drew's recollection of what was installed at Marell Poultry, anticipated the patent-in-suit.

Anschutz

This machine grades eggs according to weight and has no track, no in-track weighing and no position indicating means.

Sunkist EMG Machine

The EMG (Electro-mechanical grader) was apparently kept as a trade secret by Sunkist, thereby making this machine inapplicable as prior art. However, even if the EMG is considered as prior art, it is significantly different than the patent-in-suit because it is concerned with internal damage of citrus fruit.

The machine uses X-rays to produce its data and does not weigh the fruit at any time. There is no sorting according to weight and/or color done by this machine.

Durand-Wayland referenced several other patents in its trial exhibits, but did not discuss any of them at trial or address them in its briefs. Thus, the court must conclude that the patents referred to above are the ones Durand-Wayland is primarily relying on to support its contention that the patent-in-suit was anticipated. Accordingly, for the reasons and distinctions stated above, the court concludes that the patent-in-suit was not anticipated by the prior art.

Is the claimed invention fully described in the "specification" portion of the patent-in-suit?

In order for a patent to comply with the statute, its specification must be explicit and complete so that one skilled in the particular art could practice the invention. 35 U.S.C. §112. The statute does not require that one skilled in the particular art be able to practice the invention without any experimentation, but rather the statute requires that one skilled in the particular art be able to practice the invention without undue experimentation. White Consolidated Industries, Inc. v. Vega Servo-Control, Inc., 713 F.2d 788, 791, 218 USPQ 961, 963 (Fed.Cir. 1983). It is again important to note that the record in this action indicates that none of the expert witnesses had any difficulty in reading and/or understanding the patent.

[1] An inventor is required to fully describe what he claims as his invention, but an inventor is not required to fully describe those parts that are not claimed as the invention if those portions not claimed as the invention are within the common knowledge of persons skilled in the particular art. The parties agree that the invention claimed in the patent-in-suit is an electrical control system for controlling a conveyor so that fruit can be sorted according to weight and color (or according to weight only). Therefore, the issues raised concerning whether the disclosure of the patent-in-suit is sufficient can be answered by reviewing the patent's specification to see if it fully and completely describes an electrical control system so that one skilled in the

art could practice the invention. All of the expert witnesses agreed that the patent fully discloses and describes all of the necessary components of the electrical system. The only problem with the patent's disclosure was raised by Dr. Moore, who agreed with Durand-Wayland's counsel that one of the inverters (shown in the patent's logic circuitry) analyzing color data is inoperative. With that exception, everyone agreed that the components of the electrical control system of the claimed invention are fully and completely described.

Everything that happens to the fruit before it reaches the "color head" and everything that happens to the fruit after a decision is made as to where the fruit is to be dropped is outside the scope of what is claimed as the invention. Therefore, the patent need only describe how these extraneous items comport with the claimed invention in order to describe how the entire fruit sorting machine operates. The patent need not teach how all of these items operate, because these items are now (and were at the time the patent was applied for) within the common knowledge of the average artisan in the fruit sorting field. All of the expert witnesses agreed that getting fruit to and from particular locations was common knowledge, but that how to get and analyze color and weight data from electronic weight scales and optical detection means located along a conveyor was not.

Inasmuch as the average artisan in the fruit sorting field already knew how to get fruit to and from particular locations along a cup conveyor, the statute only requires that the inventor disclose what is claimed as his invention in such a way that the invention could be practiced. In the case at bar, Warkentin and Mills were required to disclose the electrical control system and how that system controls the cup conveyor so that fruit is sorted according to weight only or according to both weight and color. The patent-in-suit does in fact teach the average artisan how to collect and analyze data so fruit can be sorted according to weight only or according to both weight and color and how the entire fruit sorting machine operates.

The remainder of the arguments made by Durand-Wayland are concerned with items outside the scope of the electrical control system claimed by the inventors as their invention. As

stated above, the patent-in-suit adequately discloses the claimed invention and how the claimed invention operates in conjunction with the cup conveyor that actually moves the fruit to and from the weight scale and the optical detection means. Thus, the inventors met the obligation imposed on them by 35 U.S.C. §112, and the court concludes that the patent-in-suit's specification adequately describes the claimed invention.

For the reasons set forth above, the court concludes that the inventors met all of the obligations imposed on them by the patent laws concerning the patent-in-suit's specification and claims and that Durand-Wayland has not met its burden of persuasion to show that the patent-in-suit is invalid. Accordingly, the court hereby concludes that the patent-in-suit is valid.

Infringement

Patent infringement occurs when a patented invention is made, used or sold without the authority of the patent's owner. See, e.g., Panduit Corp. v. Stahlin Bros. Fibre Works, Inc., 575 F.2d 1152, 197 USPQ 726 (6th Cir. 1978). A device infringes on a patent if the device is substantialy the same in means, operations and results as the patented device (either literally or by the "doctrine of equivalents"). Graver Tank & Mfg. Co., Inc. v. Linde Air Products Co., 339 U.S. 605, 607, 85 USPQ 328, 330 (1950). The party claiming that its patent has been or is being infringed has the burden of proving infringement by a preponderance of the evidence. E.g., Hughes Aircraft Company v. United States, 717 F.2d 1351, 1361, 219 USPQ 473, 480 (Fed. Cir. 1983).

Both Pennwalt and Durand Wayland agree that the Durand-Wayland machines are substantially the same as the machine described in the patent-in-suit insofar as the results achieved. Thus, the court must focus on the "means" and "operations" of the "Microsizer" to determine whether it infringes the patent-in-suit.

> In determining whether an accused device or composition infringes a valid patent, resort must be had in the first instance to the words of the claim. If accused matter falls

clearly within the claim, infringement is made out and that is the end of it.

But courts have also recognized that to permit imitation of a patented invention which does not copy every literal detail would be to convert the protection of the patent grant into a hollow and useless thing . . . .

The doctrine of equivalents evolved in response to this experience. The essence of the doctrine is that one may not practice a fraud on a patent . . . .

What constitutes equivalency must be determined against the context of the patent, the prior art, and the particular circumstances of the case. Equivalence, in the patent law, is not the prisoner of a formula and is not an absolute to be considered in a vacuum. It does not require complete identity for every purpose and in every respect. In determining equivalents, things equal to the same thing may not be equal to each other and, by the same token, things for most purposes different may sometimes be equivalents. Consideration must be given to the purpose for which an ingredient is used in a patent, the qualities it has when combined with the other ingredients, and the function which it is intended to perform. An important factor is whether persons reasonably skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was.

A finding of equivalence is a determination of fact. Proof can be made in any form: through testimony of experts or others versed in the technology; by documents, including texts and treaties; and, of course, by the disclosures of the prior art . . . .

Graver Tank & Mfg. Co., Inc. v. Linde Air Products Co., supra, at 607-09, 85 USPQ at 330-31.

All of the Elements of the Patent-In-Suit are not present in the Durand-Wayland Machines

As an initial matter, it is important to note that the parties agree as to what constitutes the patented invention. The patent-in-suit is for an electrical control system that operates a conveyor. Thus, the claims of the patent cannot be read to cover any more than what is claimed as this particular invention, and the claims cannot be read to cover anything that is inconsistent with what is claimed as this particular invention. See, e.g., Lockheed Aircraft Corp. v. United States, 553 F.2d 69, 79, 193 USPQ 449, 458 (Ct. Cl. 1977) (en banc). As was discussed earlier, the claims of the patent describe an electrical control system that operates a cup conveyor capable of sorting fruit by weight only or by both weight and color. The machine described in the patent-in-suit employs "hard-wired" components, i.e. shift registers, comparators, shaft encoders, gates, etc. to perform the various functions that sort the fruit.

The Durand-Wayland machines also use a control system that operates a cup conveyor that is capable of sorting fruit by weight only and by both weight and color, but these machines employ a microprocessor(s) instead of 'hard-wired' components. Both the machine described in the patent-in-suit and the "Microsizer" are virtually identical *except* for the control system that conducts the sorting operations. For the reasons discussed below, the Durand-Wayland machines cannot be said to *literally* infringe the patent-in-suit, because these machines do not use the "hard-wired" components or elements which perform the identical functions as those described in the patent-in-suit, and these machines do not make the color decision until after the fruit has arrived at the electronic weight scale (whereas the machine described in the patent-in-suit makes the color comparison while the fruit is in transit from the color detectors to the electronic weight scale). Therefore, if infringement exists, it must be through the "doctrine of equivalents."

The machine described in the patent-in-suit generates a signal proportional to the weight of the item. The "Microsizer" generates a signal proportional to the weight of the item and the

cup. Thus, the "Microsizer" is more accurate than the machine described in the patent-in-suit, since the "Microsizer" is able to take into account any "foreign" matter that may accumulate inside the cup. The signal that is generated by the "Microsizer" is not proportional (and cannot be made proportional by mathematical computation) to the weight of the fruit.

The machine described in the patent-in-suit compares analog signals with analog reference voltages in order to determine the weight and color data. The "Microsizer" also produces analog signals, but before any comparison takes place, each analog signal is converted to a digital number. After the conversion takes place and a number is obtained, the "Microsizer" performs a series of subtractions within the software of the microprocessor to determine the weight and color data. Thus, the "Microsizer" does not literally compare signals as described in the patent-in-suit, but rather the "Microsizer" uses mathematical calculations to determine the desired weight and color data. This procedure achieves the same result as does the comparison that is described in the patent-in-suit, although it is a different process.

The machine described in the patent-in-suit uses shift registers that respond to "clock pulses" in order to indicate the various positions of the items to be sorted before each item is discharged. The "Microsizer" does not have any "indicating means" to determine positions of the items to be sorted since the microprocessor stores weight and color data, not the positions of the items to be sorted. After a piece of fruit has been analyzed by the "Microsorter" and while it is in transit from the optical detection means to the weight scale, the color value determined by the "Microsorter" is sorted in a color value queue. A color value queue pointer (which changes in value) points to the location of the data corresponding to the next piece of fruit to reach the weight scale. A weight value queue pointer (which also changes in value) is used to correspond to the number of cups between the weight scale and the drop location. The microprocessor software utilizes a random access memory that stores the digital numbers which resulted from the conversion of the analog signals generated by the "Microsorter" and the weight

scale, and the queue pointers (under clock control) point to the memory location that has the data about a piece of fruit. The data is never "shifted" around, but rather is just stored in memory until the software routines call for data to be utilized in subsequent portions of the program(s). Thus, the "Microsizer" has neither a "first position indicating means" nor a "second position indicating means." The machine described in the patent-in-suit produces signals that indicate where the fruit is, i.e. track the progression of each cup. The "Microsizer" does not.

The machine described in the patent-in-suit generates a signal proportional to the color of the item. The "Microsizer" (with a "Microsorter" apparatus) operates on the amount of light that reflects off of a piece of fruit, and the microprocessor software applies mathematical calculations to the digitized color data in order to sort according to color. The "Microsizer" does not provide a signal which is proportional to the color of a piece of fruit.

The "Microsizer" does not employ substantially the same means as the Patent-In-Suit, nor does the "Microsizer" function in substantially the same way

> In determining the question of infringement, it has long been established that the claims of a patent define the metes and bounds of an invention and must be looked to in determining if there has been infringement * * * * However, the scope and breadth of the claimed subject matter must necessarily be established before the question of infringement can be resolved * * * *
>
> It is a corollary of the above that while the specification and drawings of a patent may lend aid in interpreting the claims, * * * the claims of a patent are not limited in scope to the best mode for practicing the invention or to any particular mode for practicing the invention that is described in the specification or drawings * * * * A patent should be accorded a liberal

> interpretation where it discloses not just an improvement in existing equipment, but rather a different route yielding a basic solution to a long-existing problem.

Lockheed Aircraft Corp. v. United States, 553, F.2d at 79 (citations omitted).

The court previously found that the patent-in-suit described a machine capable of sorting fruit by weight and color at high speed with a high degree of accuracy in one operation. However, the machine disclosed in the patent-in-suit was carefully described so that it did not read on the prior art. The disclosed machine is properly characterized as a significant improvement in existing equipment rather than being characterized as a "pioneer" patent. Thus, the court concludes that the claims of the patent should be read in light of the careful phraseology chosen by the inventors.

The parties agree that the claims set forth in the patent-in-suit are of the "means for" variety. 35 U.S.C. §112 governs such claims and provides in pertinent part that

> [a]n element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The court in Lockheed Aircraft went on to state that

> [w]hile it is thus essential in clauses which utilize "means" clauses to look to the specification to establish the structure covered thereby, it is also imperative that para. 2 of 35 U.S.C. §112, which requires that the claims of a patent particularly point out and distinctly claim the subject matter that the applicant regards as his invention, not be totally ignored.

553 F.2d at 80-81, 193 USPQ at 459 (footnote omitted). Thus, the structure disclosed in the patent-in-suit should be looked at and read in conjunction with the "means for" claims in order to

decide the scope of the "means for" claims. Id. at 81, 193 USPQ at 459.

When a patent uses "means for" terminology in its claims to set forth

> a means for performing a specific function, without reciting any specific structure for performing that function, the structure disclosed in the specification must be considered, and the patent claim construed to cover both the disclosed structure and equivalents thereof * * * *
>
> * * *

It has often been said that a useful guide in adjudging the equivalency between a claimed and an accused device is whether persons reasonably skilled in the art would have known of the interchangeability of a part in the accused device * * * *
Id. at 82, 193 USPQ at 460, 461.

The expert witnesses in this action all agreed that microprocessors were on the market at the time the patent-in-suit was applied for. However, all of the expert witnesses stated that the microprocessors on the market in the early and middle 1970's were less powerful and more costly than the microprocessors which became available in the late 1970's and early 1980's. The evidence brought forward by both parties also shows that a microprocessor has no utility without properly functioning "software." It is a microprocessor's "software" that controls the operation of the computer, and in the case of the "Microsizer", it is the "software" that determines the weight data, color date (if a "Microsorter" is present) and the particular drop locations.

Therefore, the court's inquiry becomes two-fold: do the "means for" claims of the patent-in-suit include the use of microprocessing computers; and if so, is the particular microprocessing computer used in the "Microsizer" the legal equivalent of the "hard-wired" components described in the patent-in-suit.

Durand-Wayland argues that since Warkentin and Mills were aware of microprocessors before they applied for the

patent-in-suit and did not specifically refer to microprocessors in the patent-in-suit, Warkentin and Mills elected to limit the "means for" claims of the patent to "hard-wired" components. Based on the evidence as well as the applicable law, Durand-Wayland's argument is incorrect.

It is fundamental that an inventor need only disclose the best mode conceived by him for practicing the invention, not all conceivable modes, and it has long been settled that infringement is not avoided by an equivalent that was not known at the time of the invention. Id. at 83-84, 193 USPQ at 462. The evidence at trial indicated that Warkentin and Mills were aware of microprocessors in general, but that they never attempted to operate a sorter using a microprocessor or even thought about doing so. Warkentin and Mills did not elect to limit the scope of their invention and did in fact assert "means for" claims in their patent application. The court ruled earlier that the best mode of the invention known to the inventors was disclosed in the patent's application, and that the particular claims of the patent should be accorded an interpretation consistent with words of the claims and the prior art. Neither the language of claims of the patent nor the prior art require that the claims of the patent-in-suit be read to include only those devices that use the components described in the patent-in-suit's claims and specification. Accordingly, the court concludes that the "means for" claims of the patent-in-suit are not limited to "hard-wired" components and can be read to include microprocessing computers that are the legal equivalents of the disclosed "hard-wired" components.

Before turning the inquiry to whether the particular microprocessing computer used in the "Microsizer" (as well as the microprocessing computer used in the "Microsorter" when that apparatus is present) infringes the "means for" claims of the patent-in-suit, it is important to keep in mind the words of the Supreme Court on the "doctrine of equivalents":

> The wholesome realism of this doctrine is not always applied in favor of a patentee but is sometimes used against him. Thus, where a device is so far changed in principle

> from a patented article that it performs the same or a similar function in a substantially different way, but nevertheless falls within the literal words of the claim, the doctrine of equivalents may be used to restrict the claim and defeat the patentee's action for infringement. Westinghouse v. Boyden Power Brake Co., 170 U.S. 537, 568. In its early development, the doctrine was usually applied in cases involving devices where there was equivalence in mechanical components. Subsequently, however, the same principles were also applied to compositions, where there was equivalence between chemical ingredients. Today the doctrine is applied to mechanical or chemical equivalents in compositions or devices.

Graver Tank and Mfg. Co., Inc. v. Linde Air Products Co., supra, at 608-09, 85 USPQ at 330.

As has been stated earlier, Pennwalt alleges that the microprocessor(s) and the "software" operating it are the legal equivalents of the "hard-wired" components described in the patent-in-suit. Durand-Wayland argues to the contrary. For the reasons set forth below, the court concludes that the elements used in the Durand-Wayland machines are not the legal equivalents of the components disclosed in the patent-in-suit.

The court earlier quoted language from Lockheed Aircraft which states the test for adjudging the equivalency between a claimed invention and an accused device. In determining the level of skill in the art of sorting items to decide whether the average artison would have known of the interchangeability of the microprocessor(s) found in the "Microsizer" with the "hard-wired" logic circuitry disclosed in the patent-in-suit, it is important to remember the past history of this particular art. The sorting industry developed in the 1950's and early 1960's around machines that were mechanical in nature, e.g., MUMMA. By the middle 1960's, the sorting machines were electromechanical in nature, e.g. ROBERTS. By the early 1970's, the sorting machines began to include electronic designs, e.g. McCLURE. By the middle and late 1970's, the machines began to include electronic and logic circuit design,

e.g. the patent-in-suit. Then in the last several years as microprocessing computers became available, machines began to use microprocessors to analyze data, e.g. the "Microsizer."

Although the alleged equivalent device need not have been known or in existence at the time the patent was applied for, Lockheed Aircraft Corp. v. United States, 553 F.2d 69, 84, 193 USPQ at 462 (Ct. Cl. 1977) (en banc), after the alleged equivalent device does become available, the average artisan in the particular field should know of its interchangeability with the components disclosed in the patent if equivalency is to be found. Hughes Aircraft Company v. United States, 717 F.2d 1351, 1364-65, 219 USPQ 473, 483 (Fed. Cir. 1983).

All of the elements found in the patent-in-suit are not present in the "Microsizer," although the claims of the patent-in-suit are broad enough to include microprocessing computers. Thus, because the "Microsizer" uses different elements and different operations (on the elements it does use) than the elements and operations disclosed in the patent-in-suit to achieve the desired results, infringement can only be found if the different elements and operations are the legal equivalents of those disclosed in the patent-in-suit.

The court concludes that the average artison in the sorting field would not have known of the interchangeability of microprocessors (with appropriate "software") and the electronic and logic circuit design disclosed in the patent-in-suit, and that the "Microsizer" functions in a substantially different manner than does the machine disclosed in the patent-in-suit. As was seen in the prior art referenced against the patent-in-suit by the patent examiner and Durand-Wayland, electromechanical machines took the place of mechanical machines by using different elements to perform functions in a substantially different manner. Likewise, machines utilizing electronic and logic circuit design took the place of electromechanical machines by using different elements to perform functions in a substantially different manner. The prior art of the sorting industry indicates that when the technology changes not only do the elements used in sorting machines change, but also the operations of the machines change significantly and substantially. Although the

desired result may remain the same, the functions performed and operations employed by the machines to achieve the desired result change significantly.

The record in this action shows that although the average artisan in the sorting art may well have been aware that the technology had changed from electronic and logic circuitry to microprocessors, he was not aware of the new elements, functions and operations that had to be developed in order to successfully implement a microprocessor based sorting machine. In a microprocessor based machine, signals that represent weight and color data must be digitized and analyzed mathematically by "software" instead of the comparison of signals to reference signals used in the electronic and logic circuitry based machines. The average artisan in the art was not aware of the interchangeability of microprocessors (with appropriate "software") with "hard-wired" components. The manner in which the "Microsizer" makes its decision on where to drop the fruit is not substantially the same as the manner disclosed in the patent-in-suit, because the "Microsizer" employs different operations and methods to perform different functions. The control system used by the "Microsizer" generates weight data (and if a Microsorter" is used, color data) by digitizing analog signals, and this data by digitizing analog signals, and this data is stored and analyzed by a microprocessor(s) that utilizes special "software" capable of operating the machine in a way that drops fruit of the same weight (or same weight and color) at the same drop location. The control system disclosed in the patent-in-suit achieves the same result, but the functions performed (generating electronic signals proportional to the weight or color of the fruit) and the operations employed (data analyzed by circuitry) are different. Inasmuch as the average artisan in the sorting industry would not have known of the interchangeability of the microprocessor(s) and its software with the electronic and logic circuitry disclosed in the patent-in-suit, the elements of the "Microsizer" are not the legal equivalents of the components disclosed in the patent-in-suit.

The court accords the unbiased, well-qualified and scholarly opinion of Dr. Vacroux great weight. However, (perhaps

because of the limitations on the court's technical expertise, knowledge and understanding in the fields involved) the court is unable to adopt the position of Dr. Vacroux that the machines in question are the functional equivalents of each other. To the contrary, the court concludes that the differences in the Durand-Wayland's machines are substantial and significant enough to escape a charge of infringement by Pennwalt. Accordingly, the court concludes that the Durand-Wayland machines do not infringe the patent-in-suit.

Conclusion

For the reasons set forth above, the court hereby concludes that United States Patent No. 4,106,628 is valid, and that the "Microsizer" utilizing software labelled either Version 2 or Version 5 and the "Microsizer" with a "Microsorter" apparatus utilizing software labelled Version 6 manufactured by Durand-Wayland, Inc. do not infringe upon United States Patent No. 4,106,628. The court hereby orders counsel for both parties to submit an order consistent with the above opinion and a memorandum setting forth the issues that remain in this action within thirty (30) days of the date of this opinion.

So Ordered.

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF GEORGIA
NEWNAN DIVISION

PENNWALT CORPORATION	)	
	)	CIVIL
v.	)	ACTION NO.
	)	C80-114N
DURAND-WAYLAND, INC.	)	

ORDER

In an order dated March 22, 1984, this court found United States Patent No. 4,106,628 (hereinafter referred to as "the patent" or "the patent-in-suit") to be valid but not infringed by the machines manufactured by defendant Durand-Wayland, Inc. Presently before the court is Pennwalt Corporation's motion for supplemental findings of fact and conclusions of law.

In its motion, Pennwalt contends that the court's March 22, 1984 order implicitly found that the patent-in-suit was not obvious, but in order to perfect the record for appeal such a finding must be express. Durand-Wayland contends that the court did not address the question of obviousness in the March 22, 1984 order, but does agree with Pennwalt that the court should make additional findings of fact and conclusions of law on the issue of obviousness.

The Supreme Court, in *Graham v. John Deere Co.*, 383 U.S. 1 (1966), set forth the factual determinations a trial court must make in order to decide whether or not a patent is obvious:

> Under [35 U.S.C.] §103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined.

Id. at 17.

On pages 13-19 of the court's March 22, 1984 order, the scope

and content of the prior art were discussed and determined; on pages 26-30, the differences between the prior art and the claims at issue were ascertained; and on pages 32-33 and 46-47, the level of ordinary skill in the fruit sorting field was resolved. The court agrees with Pennwalt that pages 32-33 and 46-47 of the March 22, 1984 order implicitly found that the patent-in-suit was not obvious, and the court now makes that finding explicit.

Based upon the factual findings made in the March 22, 1984 order as to the scope and content of the prior art, the differences between the prior art and the claims at issue and the level of ordinary skill in the fruit sorting field (referenced above), the court concludes that the patent-in-suit was not obvious. 35 U.S.C. §103 requires that the claims of a patent be declared invalid only when the invention set forth in those claims can be said to "have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." As the court stated on page 32 of the March 22, 1984 order, how to get and analyze color and weight data from electronic scales and optical detection means was not common knowledge in the fruit sorting field at the time of the invention disclosed in the claims of the patent-in-suit. Accordingly, the court concludes and hereby expressly finds that the patent-in-suit was not obvious and is not invalid under 35 U.S.C. §103.

The March 22, 1984 order also ordered counsel for both parties to submit a memorandum setting forth the issues that remain in this action. In their joint memorandum of remaining issues, counsel for both parties agree that only issues remaining in this action are as follows:

> (1) Whether Durand-Wayland, Inc. is entitled to an award of costs under Rule 54(d), Fed. R. Civ. P., or whether each party shall bear its own costs?
>
> (2) Whether Durand-Wayland, Inc. is entitled to an award of attorney's fees under 35 U.S.C. §285, or whether each party shall bear its own attorney's fees?

Inasmuch as counsel for both parties agree that these are the only issues remaining in this action, the court hereby orders

that each party submit briefs (and other documents if necessary) on these two issues within thirty (30) days of the date of this order. In the alternative, the parties may wish to agree on a different time schedule for the resolution of the remaining issues. Therefore, the court orders that each party submit either briefs on these two issues or a joint memorandum setting forth a time schedule for resolving these two issues within thirty (30) days of the date of this order. The Clerk of this Court is directed to submit this file at the end of the thirty (30) day period.

SO ORDERED, this 26 day of April, 1984.

G. ERNEST TIDWELL
JUDGE, UNITED STATES
DISTRICT COURT

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF GEORGIA
NEWNAN DIVISION

PENNWALT CORPORATION

v.

DURAND-WAYLAND, INC.

Civil Action No. C80-114N

ORDER

Received: Mar. 27, 1984 Seidel, Gonda & Goldhammer, P.C.

Filed: Mar. 23, 1984 Ben H. Carter, Clerk

Plaintiff, Pennwalt Corporation ("Pennwalt"), is a Pennsylvania corporation having a principal place of business in Philadelphia, Pennsylvania. Pennwalt filed the above-styled patent infringement action on September 26, 1980, alleging that it is the owner of United States Patent No. 4,106,628 (hereinafter referred to as "the patent" or "the patent-in-suit") and that the defendant, Durand-Wayland, Inc. ("Durand-Wayland"), has been and is now infringing upon the patent by its marketing of certain fruit sorting machines. Durand-Wayland is a Georgia corporation having its principal place of business in LaGrange, Georgia. In its amended answer, Durand-Wayland attacked the validity of the patent, denied infringement, and alleged several counterclaims, but the parties and the court agreed that Pennwalt's contentions of patent validity and patent infringement should be tried before any other issues in this case are allowed to proceed.

After an extended discovery period, this action was set for trial on the validity and infringement issues. A trial

on these two issues was conducted on the following days: February 28 – March 5, 1983; March 29-31, 1983; April 26-29, 1983; and October 11-13, 1983. Shortly after the trial began, the court determined that a court-appointed expert would be both helpful and necessary in the adjudication of the extremely technical issues raised in this patent action. Therefore, Dr. Andre G. Vacroux, Dean of the College of Engineering at the Illinois Institute of Technology in Chicago, Illinois, was retained as the court-appointed expert. *See* Rule 706, Fed. R. Evid. At the conclusion of the trial, a briefing schedule was agreed upon, thereby allowing both parties the opportunity to submit their legal analyses of the case to the court. Inasmuch as the briefing schedule has been concluded, this action is ripe for disposition on the merits.

On the first day of trial (February 28, 1983), the court ruled that Pennwalt's chain of title to the patent was not impaired in any way and that Pennwalt does not in fact have good title to the patent-in-suit. The following opinion will constitute this court's "findings of fact" and "conclusions of law" pursuant to Rule 52(a), Fed. R. Civ. P., on the issue of whether the patent-in-suit is valid and on the issue of whether the machines marketed by Durand-Wayland infringe the patent-in-suit.

THE PATENTED INVENTION

The patent-in-suit describes a high speed machine that is able to electronically determine the weight and color of fruit (the machine is capable of sorting a wide variety of items, but for clarity the court will refer to "fruit" as the item(s) to be sorted). The machine is capable of sorting a piece of fruit into one of several combined weight and color categories in a single sorting operation. The machine does this by using a color sensor and a weight

sensor to produce electrical signals representative of the color and the weight, and these two signals are processed to yield a combined weight/color signal which is used to sort the fruit downstream of the color and weight sensors.

Fruit is delivered from a storage bin onto a belt conveyor and then to a roller conveyor, called a singulator, which aligns the fruit into several single file lanes. The singulator transports the fruit beneath an optical detection device, or "color head", which is comprised of a number of light sources arranged to illuminate the fruit and a number of light detectors arranged to measure the intensity of light reflected from the fruit. The intensity of the reflected light varies according to the color of the fruit. The optical detection device produces a signal that is proportional to the color of the piece of fruit passing beneath it.

The signal from the optical detection device is amplified and then processed by electrical circuitry to provide a digital "word" indicative of the piece of fruit's color. This process is performed by comparing the particular signal from the optical detection device to certain color reference signals set by the machine's operator. The color reference signals represent the parameters between each color grade and are set according to the color grades desired by the operator.

After the fruit has been transported beneath the optical detection device, it is discharged from the singulator into one of a series of cups arranged along a continuous belt. This cup conveyor is driven so that it moves in synchronism with the singulator. The cup conveyor transports each cup (with a piece of fruit inside it) to a weighing station located downstream from the optical detection device. The weighing station consists of an electronic scale incorporated into a portion of the cup conveyor

track. The weighing station is beneath the path of the cups, so that the cup can be weighed while it is in motion and in transit over the electronic scale. This scale provides a weight signal that is proportional to the combined weight of the cup and fruit. The weight signal is then processed by electrical circuitry to provide a digital "word" indicative of the weight of the cup and fruit. This is performed by comparing the weight signal to predetermined weight reference signals set by the machine's operator. The weight reference signals represent parameters between each weight grade and are set according to the weight grades desired by the operator.

A shaft encoder, driven by the cup conveyor chain, generates a pulse every time the cups on the conveyor belt and the pockets in the singulator have moved a predetermined distance. As a piece of fruit is transported from the optical detection device to the electronic scale, an electronic circuit stores the color grade data for that piece of fruit. The particular electronic circuit shown in the patent-in-suit is a shift register. The shift register has a number of sequential stages equal to the combined number of pockets and cups between the optical detection device and the electronic scale, and each stage in the shift register stores color grade data for a particular piece of fruit in transit from the optical detection means to the electronic scale. The shift register is responsive to the pulses generated by the shaft encoder so that the color grade data is shifted one stage for each pulse received from the shaft encoder. As soon as a piece of fruit reaches the weighing station, its corresponding color grade data is shifted out of the last stage of the shift register and is made available to the processing circuitry. This processing circuitry combines the color grade data with the weight grade data for the purpose of determining which of a plurality of drop locations should receive the fruit.

The determination of the particular drop location for a piece of fruit is based on the combined color and weight of the fruit, and the particular inputs selected by the operator for fruit of this color and weight grade. The drop locations for the fruit are arranged serially downstream from the electronic scale, and each drop location is signified by a gap in the cup conveyor track. The gap is normally filled by a solenoid-actuated pin, so that when the pin is in its normal position the cup rides over the gap without falling. However, when the pin is retracted by solenoid action, the cup is allowed to tilt downward and the fruit is discharged at that particular drop location.

The determination of which location to drop each piece of fruit is stored in an electronic circuit. The patent indicates that the electronic circuit is comprised of a plurality of shift registers, with one shift register assigned to each drop location. The length of each shift register corresponds to the number of cups from the electronic scale to its associated drop location. A digital "1" is entered into the appropriate shift register by the processing circuitry depending upon the location where the fruit is to be discharged. All other shift registers receive a digital "0". When a "1" is shifted out of the last stage of any shift register, the corresponding discharge mechanism is activated.

Therefore, the machine is able to sort into many categories based on two criteria, weight and color. The machine uses two position indicating circuits: the first position indicating circuit continuously keeps track of the fruit as it is in transit from the optical detection device to the electronic scale, and the second position indicating circuit continuously keeps track of the fruit as it is in transit from the electronic scale to the drop locations. The color and weight signals are processed and combined so that

the fruit is not physically sorted until it has reached its final destination. The patent provides for a machine that, in one operation, sorts fruit by weight and color at high speed and with a high degree of accuracy.

THE DURAND-WAYLAND MACHINES

Durand-Wayland manufactures and sells two different types of automatic fruit sorting machines, both of which Pennwalt alleges infringe upon the patent-in-suit. One machine sorts fruit by weight only and is called the "Microsizer", whereas the other machine sorts fruit by both weight and color. The machine that sorts according to both weight and color consists of a "Microsizer" operating in conjunction with a "Microsorter", an apparatus concerned with the detection of reflected light from a piece of fruit. A "Microsizer", without a "Microsorter" apparatus, contains software labelled either Version 2 or Version 5, and no machine using either Version 2 or 5 software has ever been able to sort fruit according to color. The first software version able to sort according to color was Version 6 to be used on a "Microsizer" with a "Microsorter" apparatus.

The "Microsizer" consists of a cup conveyor for transporting the items to be sorted, with each cup to carry a single piece of fruit. A strain gauge weight scale is used for weighing the item and the cup, and this scale is in the path of travel of the cups so that the cups can be weighed while in motion. The "Microsizer" has a microprocessor or central processing unit ("CPU") which uses either Version 2 or 5 software to control the operation of the machine. The structure of the "Microsizer" also includes a shaft encoder as well as solenoids to operate the drop mechanism for discharging a piece of fruit. The major hardware control elements of a "Microsizer" having ei-

ther Version 2 or 5 software are the CPU card, a random access memory ("RAM"), program storage, an encoder, analog to digital converters and relays interfaced with the drop solenoids.

The "Microsizer" that includes the "Microsorter" consists of a singulator for carrying fruit under a pair of "color heads" (which are found within the "Microsorter"). As a piece of fruit passes under, one "color head" receives light reflected from the left top of the fruit and the other "color head" receives light reflected from the right top of the fruit. A cup conveyor then receives the piece of fruit from the singulator. The fruit is weighed (in the same manner as described above) and is then discharged by the operation of a solenoid.

The hardware components of the "Microsorter", the color sensing portion of the Durand-Wayland machine, include: the light sensors; an analog to digital converter; a microprocessor called CPU 1; and an encoder. The major hardware components of CPU 1 are a Z-80 market computer card, a RAM board and an input/output ("I/O") board. CPU 1 is loaded with software labelled Version 3, and its function is to gather information regarding the amount of light reflected off a piece of fruit. The encoder allows CPU 1 to sample the reflected light along different parts of the fruit. The "Microsorter" itself contains no means for determining the color grade of an item, but rather the "Microsizer" (one capable of sorting by weight and color) makes this determination.

The other hardware components of the "Microsizer" that includes the "Microsorter" are: the weight scale; an analog to digital converter; a second microprocessor called CPU 2; and three photoeyes and relays connected to the solenoids. The major hardware components of CPU 2 are a Z-80 microprocessor computer card, a RAM card

and I/O ports. CPU 2 takes the information from the weight scales and the color information from CPU 1 and determines where to drop the fruit. CPU 2 is loaded with software labelled Version 6 to control the operation of this "Microsizer".

DEVELOPMENT OF THE PATENTED INVENTION

The patented invention was developed during the period from December, 1974, to August, 1975. Prior to and during development of the patented invention, Aaron J. Warkentin, one of the co-inventors, was the president of Tilt-Belt Systems, Inc. ("Tilt-Belt"), a California corporation engaged in the business of manufacturing new equipment for, and reselling used equipment to, the fruit and vegetable packing industry. Warkentin had considerable experience as a farmer and as a packer of fruit, and prior to designing the machine described in patent-in-suit, he had designed other machinery used in the fruit packing industry.

George Mills, the other co-inventor, had been employed by Sunkist Growers, Inc. ("Sunkist") from 1968 to April, 1970, and his primary responsibility was to design the optical portions of Sunkist's X-ray grader that determined internal damage to citrus fruits. He also worked on the optics for a blemish scanner, but the record indicates that the optics of these machines were not designed either to weigh fruit or to determine the color of a piece of fruit. After he left full-time employment at Sunkist on April 1, 1970, Mills became a part-time consultant to Sunkist. Mills worked on his own farm in addition to his consulting work for Sunkist, and during the period of time Mills worked as a consultant, he did not have access as to what was going on at Sunkist on a daily basis. Mills was a

consultant to Sunkist from April of 1970 to October 31, 1974.

None of the work done by Mills while he was an employee of or a consultant to Sunkist involved sorting fruit by weight or color. As a consultant, Mills worked primarily on a machine designed to imprint Sunkist's trademark on citrus fruit, as well as additional work on "dirtfree" optics for a blemish detector, and "paper" design work on a laser scanner.

Mills and Warkentin apparently met for the first time in June, 1974. Mills had been asked by Mr. David Cairns of Cairns Orchards in Lemon Cove, California, to examine an automatic accounting system for a box packaging machine with which Cairns Orchards was having problems. Mr. Cairns was a customer of Tilt-Belt and a friend of Warkentin, and introduced Warkentin to Mills in June, 1974. In August of 1974 on behalf of Tilt-Belt, Warkentin retained Mills to design a box packer for cantaloupes, Mills' consulting agreement with Sunkist was exclusive only as to "citrus and tree fruit" and since cantaloupes grow on vines and are not citrus fruit, this work did not violate Mills' consulting agreement with Sunkist.

Following the termination of Mills' consulting agreement with Sunkist on October 31, 1974, Warkentin disclosed to Mills his ideas about an electronic sizing machine utilizing a load cell. Warkentin and Mills did not start work on Warkentin's idea for electronically sorting fruit by weight and color until after the expiration of Mills' last Sunkist consulting agreement. The first attempt at making an electronic fruit sorting apparatus was made in December, 1974 and this attempt involved modifications to a used FMC Corporation ("FMC") mechanical weight sizer Warkentin had in stock at Tilt-Belt. In 1974,

Tilt-Belt was a dealer for FMC agricultural machines, including both new and used FMC mechanical weight sizers. The modifications Warkentin and Mills made to the FMC machine established the feasibility of electronic weighing of fruit, but this modified machine never properly sorted and discharged fruit according to weight.

Although Princess Orchards placed an order for an electronic weight sizer with Tilt-Belt on February 20, 1975, there was no sorter in existence at that time. Earl Follett, who placed the order on behalf of Princess Orchards, saw no sorter, was told that no electronic weight sorter had yet been constructed and payment for the machine was conditional on its successful construction and operation. The court finds and concludes that there was no offer for sale prior to February 20, 1975, and that no weight sorting machine, as described in the patent-in-suit, existed until the first weight sorter was installed at Princess Orchards in June, 1975.

After receipt of Princess Orchard's order, Warkentin and Mills commenced construction of a machine capable of sorting by weight. Both Warkentin and Mills made inventive contributions to the invention claimed in the patent-in-suit. Warkentin contributed the concept of combined color and weight sorting in a single operation as well as developing the mechanical aspects of the invention. Mills contributed to the weight and color processing circuitry and to the color sorting scheme. Warkentin and Mills worked together in the development of the machine described in the patent-in-suit, and the invention was their joint effort.

PRIOR ART CONSIDERED BY THE PATENT OFFICE

The following United States Patents were cited or considered by the Patent Examiner in the Patent and Trademark Office who analyzed the patent application that matured into the patent-in-suit:

Patent No.	Issue Date	Inventors
2,980,252	4/1961	Bray et al.
3,066,797	12/1962	Fraenkel
3,070,227	12/1962	Larew et al.
3,192,535	6/1965	Watson
3,206,022	9/1965	Roberts et al.
3,270,880	9/1966	Brian et al.
3,289,832	12/1966	Ramsay
3,355,015	11/1967	Cervin
3,750,883	8/1973	Irving et al.
3,773,172	11/1973	McClure et al.
3,901,334	8/1975	Rose

The Larew patent discloses an apparatus for inspecting sheet metal for pin holes and other flaws. Flaw sensors scan the metal sheet as it passes an inspection station, and upon detecting a flaw, a flaw sensor generates a digital bit which is put into one of two shift registers. The bit is shifted through the shift register in synchronism with the movement of the metal, and this bit is stored in a separate memory device until such time as the defective sheet reaches the reject station. The Larew apparatus

rejects defective sheets for any flaw, and the machine has only one discharge location.

The Watson patent discloses an automatic weighing system that includes a track along which a series of individual freight cars move and an electronic weighing means in the form of a lead cell incorporated into the track, The Watson device does not have any sorting capabilities.

The Roberts patent discloses a two-color optical sorter in which each of the color signals is compared to its own set of references. Apples to be sorted are placed in pockets on a conveyor, and a sorter arm (associated with each pocket) rides in a track parallel to the conveyor. When the color grade of an apple is determined, the sorting arm associated with the particular pocket carrying the apple is diverted by a sorting gate into one of three parallel grading tracks (one for each color grade). As soon as each sorting arm reaches the end of the grading track to which it has been diverted, the apple is dropped.

The Brian patent discloses an optical dimensional sizer which can be used for color sorting. An item to be sorted passes a series of light beams and their associated photocells. The item will eventually break one of the light beams and cause a "kicker" to be activated so that the item is moved onto a perpendicular takeaway conveyor. Items of the same size will break the same light beam, and therefore, similar items will be ejected onto the same takeaway conveyor. Brian does not disclose any circuitry describing how the system operates.

The Ramsay patent discloses a device for detecting flaws in tin cans. Cans are transported past a series of inspection stations where they are examined for flaws.

Memories called "position indicators" signify the can position relative to an inspection station, but these memories to not keep track of the position of the cans as they are transported between inspection stations. Defective cans are all rejected at a single location for any one of a number of defects.

The McClure patent discloses a machine for automatically sorting blueberries based on the amount of light (of a particular color) reflected off of each berry. Berries are placed in individual cups on a cup conveyor and carried past a color sensing station. The optical detection means respond to the light that is transmitted, and a signal is generated. This signal is processed to yield a binary logic signal representative of the grade of the berries. A memory means (in the form of a shift register) keeps track of the position of the berry and is clocked in synchronism with the conveyor. The berries are discharged (at one of three locations) when the binary logic signal reaches the output of the shift register and activates air jets which blow the berries from the conveyor.

The Rose patent discloses a machine for weighing eggs on an electronic scale which sequentially receives eggs from a roller conveyor. Eggs to be weighed are stopped and rest upon a plunger which operates a weighing scale. After being stopped and weighed, the eggs are transferred to a series of cups or receiving pockets on a second conveyor. Rose includes the concept of a memory for subsequent processing of weight data, but does not provide the specific details of such a memory.

PRIOR ART REFERENCED BY DURAND-WAYLAND

The following patents are relied upon by Durand-Wayland to invalidate the patent-in-suit:

U.S. Patents

Number	Date	Patentee
3,017,024	1/16/62	Mumma
3,627,127	12/14/71	Whiteford
3,640,384	2/8/72	Del Rosso
3,768,645	10/30/73	Conway et al.
3,770,111	11/6/73	Greenwood et al.
3,898,435	8/5/75	Pritchard et al.
3,917,069	11/4/75	Alexander
3,918,587	11/11/75	Drew, Jr.
3,948,765	4/6/76	Anschutz
4,024,053	5/17/77	Drew, Jr., et al.

The Mumma patent discloses an egg grading apparatus to sort eggs according to quality and weight. An operator must separate the eggs into one of eight quality grades by physically placing the eggs onto one of eight quality racks. All eight quality grades are merged into a single file line, and the eggs are then placed onto a conveyor. This conveyor moves the eggs to a scale where they are weighed, and another conveyor moves the eggs from the scale. A mechanical memory records both the quality grade and the weight grade of an egg. The memory actuates drop-off solenoids to deposit eggs at locations according to their quality and weight grade.

The Del Rosso patent discloses a machine for weighing odd-shaped articles. Items to be weighed are placed in buckets and are intermittently moved by two conveyors and two turntables. One of the two conveyors moves the item(s) in the bucket over a weighing platform, and the weight of the item(s) is recorded in a mechanical memory

for sorting the items after they are weighed. The memory is synchronized with the movement of the conveyors, but the buckets are not fixed on the conveyors.

The Conway patent discloses a machine for inspecting citrus fruit for internal defects by X-raying the fruit.

The Pritchard patent discloses an electronic memory for a machine which grades eggs according to their weight. Groups of six eggs are individually weighed on electromechanical scales which directly output a signal corresponding to the weight grade for the egg on the scale, and these signals are put into a primary memory unit. The data are shifted in the memory in synchronism with the movement of the conveyor, and the output of the memory activates discharge stations for discharging the eggs at the proper packing stations.

The Alexander patent discloses various embodiments of fruit sorting machinery and suggests color and weight sorting, but this patent indicates that the fruit is first physically sorted according to one of three qualities and each quality is then individually sorted into weight grades. No details of how to accomplish the sorting are disclosed.

The two Drew patents disclose an apparatus for detecting the weight of poultry suspended from shackles and for dispensing individual birds at one of a plurality of dispensing stations along the conveyor. In the first Drew patent, a latch circuit provides a fixed time delay between the time a weight measurement is taken and the time the bird is dispensed. This permits the bird to clear the scale before dispensing. The circuitry in the first patent consists of discrete electronic parts, whereas the second patent replaces the discrete electronic parts with a microprocessor.

The Anschutz patent discloses an egg sorting apparatus which sorts eggs in accordance with one of six weight grades. Eggs are transferred from a conveyor onto a strain gauge where they are weighed. The strain gauge output is fed to comparators and then to logic circuitry. The output of the logic circuitry is a binary signal appearing on one of six parallel lines corresponding to the weight grade of the egg. Each egg is moved from the strain gauge to another conveyor. The binary signal is clocked through a shift register by one stage each time the egg moves past the discharge station. Therefore, as the machine operates, the eggs are taken from a first conveyor, removed from that conveyor and placed on a strain guage, and then removed from the strain onto a second conveyor.

VALIDITY OF THE PATENT-IN-SUIT

An issued patent enjoys a statutory presumption that it is valid. 35 U.S.C. § 282 provides, in pertinent part, as follows:

> [A] patent shall be presumed valid. Each claim of a patent (whether in independent, dependent, or multiple dependent form) shall be presumed valid independently of the validity of other claims; dependent or multiple dependent claims shall be presumed valid even though dependent upon an invalid claim. The burden of establishing invalidity of a patent or any claim thereof shall rest on the party asserting such invalidity.

This statutory presumption requires the court "to employ a decisional approach that starts with acceptance of the patent claims as valid and that looks to [Durand-Wayland] for proof of the contrary". *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1534 (Fed. Cir. 1983). The

burden of persuasion on the merits remains with Durand-Wayland at all times, *id.*, and the statutory presumption of validity can be overcome only by clear and convincing evidence. *Astro-Sjuco A.B. v. U.S. Intern. Trade Comm.*, 629 F.2d 682, 688 (C.C.P.A. 1980).

Were the patent's claims anticipated by prior art?

Durand-Wayland contends that the claims of the patent are anticipated, *i.e.*, fully met, by one or more of the prior art references it raised at trial. 35 U.S.C. § 102 clearly places the burden on Durand-Wayland to show that the patent-in-suit was anticipated.

> A party asserting that a patent claim is anticipated under 35 U.S.C. § 102 must demonstrate, among other things, identity of invention. In cases like this, identity of invention is a question of fact, *e.g., Coupe v. Royer,* supra, 155 U.S. at 578-79, 15 S.Ct. at 204-05, and *one who seeks such a finding must show that each element of the claim in issue is found, either expressly described or under principles of inherency, in a single prior art reference, or that the claimed invention was previously known or embodied in a single prior art device or practice.* Preliminary to this determination, of course, is construction of the claims to determine their meaning in light of the specification and prosecution history, which construction is a matter of law for the court.

Kalman v. Kimberly-Clark Corporation, 713 F.2d 760, 771 (Fed. Cir. 1983). (emphasis added).

In order to determine if this technical defense raised by Durand-Wayland is meritorious, the court must first construe the claims of the patent-in-suit to determine their meaning before beginning an analysis of each patent raised by the defendant as prior art.

Are the patent's claims complete?

In the patent-in-suit, Warkentin and Mills state the following:

> We claim:
>
> 1. An *automatic sorting apparatus* comprising conveyance means for transporting a plurality of items to be sorted along a track and having individual cups for transporting each said item, said individual cups being connected in a continuous belt,
>
> *electronic weighing means* incorporated into a portion of said track for generating a signal proportional to the weight of said item to be sorted,
>
> *reference signal means* for providing a predetermined number of reference signals, the value of each signal established according to a predetermined criteria,
>
> *comparison means* for comparing the signal generated by said electronic weighing means to the reference signals provided by said reference signal means,
>
> *clock means* for incrementally signalling changes in position of an item to be sorted,
>
> *first position indicating means* responsive to the signal from said clock means and the signal from said comparison means for generating a signal indicative of the position of the item to be sorted, and
>
> *discharge means* responsive to the signal generated by said position indicating means for discharging the item to be sorted at a predetermined position.
>
> 2. The apparatus of claim 1 wherein said electronic weighing means comprises a *strain gauge.*

* * *

10. An *automatic sorting apparatus* comprising *electronic weighing means* for generating a signal proportional to the weight of an item to be sorted,

first reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria,

first comparison means for comparing the signal generated by said electronic weighing means to the reference signals provided by said first reference signals means,

Optical detection means for generating a signal proportional to the color of an item to be sorted,

second reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria,

second comparison means for comparing the signal generated by said optical detection means to the reference signals provided by said second reference signals means, and generating a signal therefrom,

clock means for incrementally signaling changes in the position of the item to be sorted,

first position indicating means responsive to a signal from said clock means and said signal from said second comparison means for continuously indicating the position of an item to be sorted while the item is in transit between said optical detection means and said electronic weighing means,

second position indicating means responsive to the signal from said clock means, the signal from said first comparison means and said first position indicating means for generating a signal continously indicative of the position of an item to be sorted after said item has been weighed, and

discharge means responsive to the signal from said second position indicating means for discharging the item at a predetermined one of a plurality of sorting positions.

* * *

18. An *automatic sorting apparatus* comprising *electronic weighing means* for generating a signal proportional to the weight of an item to be sorted,

first reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria,

first comparison means for comparing the signal generated by said electronic weighing means to the reference signals provided by said first reference signal means, and generating a signal therefrom,

optical detection means for generating a signal proportional to the color of an item to be sorted,

second reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria,

second comparison means for comparing the signal generated by said optical detection means to the

signals provided by said second reference signal means, and generating a signal therefrom,

clock means for incrementally signalling changes in position of the item to be sorted,

first position indicating means responsive to a signal from said clock means and the signal from a first one of said first and second comparison means for generating a signal continuously indicative of the position of an item to be sorted while the item is in transit between a first one of said optical detection means or said electronic weighing means, and the other of said optical detection means or said electronic weighing means,

second position indicating means responsive to the signal from said clock means, the signal from said first position indicating means, and the signal from the other of said first and second comparison means for generating a signal continuously indicative of the position of the item to be sorted after the item has passed the other of said optical detection means and said electronic weighing means, and

discharge means responsive to the signal from said second position indicating means for discharging the item at a predetermined one of a plurality of sorting positions.

(emphasis added).

35 U.S.C. § 112 provides, *inter alia,* that "[t]he specification shall conclude with *one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.*" (emphasis added). This portion of the statute requires that the language chosen by an inventor for his patent claims must clearly set forth the area over which he seeks "exclusive

rights". *Rengo Co. Ltd. v. Molins Machine Co., Inc.*, 657 F.2d 535, 551 (3rd Cir.), *cert. denied*, 454 U.S. 1055 (1981). The language of the claims must clearly demarcate the boundaries of the invention so that others are put on notice as to what is claimed as the invention. The purpose of this portion of the statute is to adequately notify potential infringers of the scope and function of the claimed invention. *Id.*

Patent claims are to be reasonably interpreted, and the claims should be read in light of the prior art and as it would be interpreted by one possessing the ordinary level of skill in the particular art. *Application of Moore*, 439 F.2d 1232, 1235 (C.C.P.A. 1971). Viewed in this posture, it is important to note that the record in this action indicates that not one of the expert witnesses (engineers or patent lawyers) had any significant trouble understanding the claims of the patent. Each expert seemed comfortable in his understanding of the claims, and each expert was able to analyze every claim element by element. Each expert agreed that every element set forth in the patent's claims is found in the patent's specification, even though the precise words used in the patent's specification are not necessarily used in the patent's claims. Inasmuch as the statute does not require an inventor to use the exact same words in both the specification and the claims, the court must determine whether the language used by the inventors in the patent's claims clearly and adequately set forth what is claimed as the invention, whether the language is consistent with the language used in the patent's specification, and whether the language is reasonably clear in its meaning. *Rengo Co. Ltd. v. Molins Machine Co., Inc.*, 657 F.2d at 550-51.

A reading of the patent's claims, the testimony of the expert witnesses, and both Dr. Vacroux's testimony and

report indicate that the inventors, through their patent claims, adequately notified the world as to the scope and function of the device claimed as the invention. Since the patent's claims set forth both the scope and function of the invention so that others in the art were easily able to understand the invention (Durand-Wayland had no trouble understanding the patent's claims), the patent's claims are sufficiently definite to comply with the statute.

The court now turns to the prior art referenced by Durand-Wayland to determine whether the patent-in-suit was anticipated by the pertinent prior art. As was stated by the United States Court of Appeals for the Federal Circuit in *Kalman v. Kimberly-Clark Corporation, supra*, Durand-Wayland must show that each element of the patent's claims is found in a single prior art reference or that the claimed invention existed in a single prior art device.

MUMMA

This machine sorts eggs according to both weight and quality grade. The quality grading is done by the human operator, and therefore, this machine does not accomplish its goal totally by electromechanical means. There is no second reference signal, no second comparison means and no optical detection means because this machine electromechanically sorts according to only one criterion. The weighing mechanism described in this device appears to be more mechanical than electrical, in that this device operates mechanically with electrical impulses used for comparison of the egg's weight to a predetermined reference signal. This device also does not have in-track weighing, but rather delivers an egg to the weighing platform on one conveyor and removes the egg with another conveyor.

DEL ROSSO

This machine sorts odd-shaped items (dissimilar items) according to their weight. This device does not have a track or in-track weighing, but rather places the item in buckets, moves the buckets on one conveyor to the weight platform, and after the weighing has occurred, the machine moves the buckets away on a second conveyor. This device has no clock means, no position indicating means and does not generate signals indicative of the particular bucket's locations.

CONWAY

This machine measures the internal damage in citrus fruit and does not weigh the fruit, does not have a weighing means and is not capable of processing a weight signal.

PRITCHARD

This apparatus is a memory device to be used with an egg grading machine, and it is capable of only analyzing weight data. The memory device is not designed for a machine capable of in-track weighing, but rather for a machine in which one conveyor brings the egg to the weight scale and another conveyor moves the egg away from the weight scale. Since this device is a memory device to be used with an egg grading machine, it is difficult to compare this device with the patent-in-suit because the patent-in-suit discloses how the memory works in conjunction with a sorting machine. The memory device in Pritchard teaches shift registers, clock means and other information about storing weight data, but this particular patent does not disclose a memory device capable of being used in a machine that has an electronic weighing means and/or optical detection means.

ALEXANDER

This machine sorts hard fruit by requiring a human operator to view the fruit and inspect it for damage. This patent discloses an arrangement of mirrors capable of improving the optical inspection of fruit, and the disclosed apparatus uses a memory to keep track of the motion of the fruit. This patent suggests color and weight sorting as well as suggesting the use of a computer to combine various grading methods, but the patent does not give any details of how these ideas are to be accomplished.

DREW (two patents)

These machines sort poultry by weight; one uses discrete electrical circuitry and the other uses a microprocessor. Poultry is suspended from shackles on an overhead rail, and the poultry is weighed at a platform in the rail. There is one weighing platform for each grade to be sorted, and the weighing platform instantly determines whether the particular bird is within the desired weight parameters, and if so, the machine drops the bird as soon as it clears the weight scale. The machines do not keep account of the birds as the weighing process occurs and do not track the birds after the weighing has occurred because there is no clock means, no position indicating means and no downstream drop locations for all of the birds.

Durand-Wayland contends that Drew delivered a paper at a conference in which he described his machine and showed how his machines continued to track the birds from the weight scales to the discharge locations, if the birds were not discharged at the location of that particular weight scale. The record in this action indicates that the Drew paper that was delivered at the conference was

not a "printed publication" within the meaning of § 102, and the contents of the Drew paper were not available to the public until after the patent-in-suit was applied for. Thus, anything about the Drew patents outside the scope of these two patents themselves was not known to the inventors before they filed their patent application.

Although Drew also testified about an installation of a poultry machine at Marell Poultry, the evidence was insufficient to indicate what was actually installed at that site. The defendant is relying solely on the recollection of Drew and the court concludes that this is insufficient to support a finding that the drew patents, read in conjunction with Drew's recollection of what was installed at Marell Poultry, anticipated the patent-in-suit.

ANSCHUTZ

This machine grades eggs according to weight and has no track, no in-track weighing and no position indicating means.

SUNKIST EMG MACHINE

The EMG (Electro-mechanical grader) was apparently kept as a trade secret by Sunkist, thereby making this machine inapplicable as prior art. However, even if the EMG is considered as prior art, it is significantly different than the patent-in-suit because it is concerned with internal damage of citrus fruit. The machine uses X-rays to produce its data and does not weigh the fruit at any time. There is no sorting according to weight and/or color done by this machine.

Durand/Wayland referenced several other patents in its trail exhibit, but did not discuss any of them at trial or address them in its briefs. Thus, the court must conclude that the patents referred to above are the ones Durand-Wayland is primarily relying on to support its contention

that the patent-in-suit was anticipated. Accordingly, for the reasons and distinctions stated above, the court concludes that the patent-in-suit was not anticipated by the prior art.

Is the claimed invention fully describe in the "specification" portion of the patent-in-suit?

In order for a patent to comply with the statute, its specifications must be explicit and complete so that one skilled in the particular art could practice the invention. 35 U.S.C. § 112. The statute does not require that one skilled in the particular art be able to practice the invention without any experimentation, but rather the statute requires that one skilled in the particular art be able to practice the invention without undue experimentation. *White Consolidated Industries, Inc. v. Vega Servo-Control, Inc.*, 713 F.2d 788, 791 (Fed. Cir. 1983). It is again important to note that the record in this action indicates that none of the expert witnesses had any difficulty in reading and/or understanding the patent.

An inventor is required to fully describe what he claims as his invention, but an inventor is not required to fully describe those parts that are not claimed as the invention if those portions not claimed as the invention are within the common knowledge of persons skilled in the particular art. The parties agree that the invention claimed in the patent-in-suit is an electrical control system for controlling a conveyor so that fruit can be sorted according to weight and color (or according to weight only). Therefore, the issues raised concerning whether the disclosure of the patent-in-suit is sufficient can be answered by reviewing the patent's specification to see if it fully and completely describes an electrical control system so that one skilled in the art could practice the invention. All of the expert witnesses agreed that the patent fully dis-

closes and describes all of the necessary components of the electrical system. The only problem with the patent's disclosure was raised by Dr. Moore, who agreed with Durand-Wayland's counsel that one of the inverters (shown in the patent's logic circuitry) analyzing color data is inoperative. With that exception, everyone agreed that the components of the electrical control system of the claimed invention are fully and completely described.

Everything that happens to the fruit before it reaches the "color head" and everything that happens to the fruit after a decision is made as to where the fruit is to be dropped is outside the scope of what is claimed as the invention. Therefore, the patent need only describe how these extraneous items comport with the claimed invention in order to describe how the entire fruit sorting machine operates. The patent need not teach how all of these items operate, because these items are now (and were at the time the patent was applied for (within the common knowledge of the average artisan in the fruit sorting field. All of the expert witnesses agreed that getting fruit to and from particular locations was common knowledge, but that how to get and analyze color and weight data from electronic weight scales and optical detection means located along a conveyor was not.

Inasmuch as the average artisan in the fruit sorting field already knew how to get fruit to and from particular locations along a cup conveyor, the statute only requires that the inventor disclose what is claimed as his invention in such a way that the invention could be practiced. In the case at bar, Warkentin and Mills were required to disclose the electrical control system and how that system controls the cup conveyor so that fruit is sorted according to weight only or according to both weight and color. The patent-in-suit does in fact teach the average artisan how

to collect and analyze data so fruit can be sorted according to weight only or according to both weight and color and how the entire fruit sorting machine operates.

The remainder of the arguments made by Durand-Wayland are concerned with items outside the scope of the electrical control system claimed by the inventors as their invention. As stated above, the patent-in-suit adequately discloses the claimed invention and how the claimed invention operates in conjunction with the cup conveyor that actually moves the fruit to and from the weight scale and the optical detection means. Thus, the inventors met the obligation imposed on them by 35 U.S.C. § 112, and the court concludes that the patent-in-suit's specification adequately describes the claimed invention.

For the reasons set forth above, the court concludes that the inventors met all of the obligations imposed on them by the patent laws concerning the patent-in-suit's specification and claims and that Durand-Wayland has not met its burden of persuasion to show that the patent-in-suit is invalid. Accordingly, the court hereby concludes that the patent-in-suit is valid.

INFRINGEMENT

Patent infringement occurs when a patented invention is made, used or sold without the authority of the patent's owner. *See, e.g., Panduit Corp. v. Stahlin Bros. Fibre Works, Inc.*, 575 F.2d 1152 (6th Cir. 1978). A device infringes on a patent if the device is substantially the same in means, operation *and* results as the patented device (either literally or by the "doctrine of equivalents"). *Graver Tank & Mfg., Co., Inc., v. Linde Air Products Co.*, 339 U.S. 605, 607 (1950). The party claiming that its patent has been or is being infringed has the

burden of proving infringement by a preponderance of the evidence. *E.g., Hughes Aircraft Company v. United States,* 717 F.2d 1351, 1361 (Fed. Cir. 1983).

Both Pennwalt and Durand-Wayland agree that the Durand-Wayland machines are substantially the same as the machine decscribed in the patent-in-suit insofar as the results achieved. Thus, the court must focus on the "means" and "operations" of the "Microsizer" to determine whether it infringes the patent-in-suit.

> In determining whether an accused device or composition infringes a valid patent, resort must be had in the first instance to the words of the claim. If accused matter falls clearly within the claim, infringement is made out and that is the end of it.
>
> But courts have also recognized that to permit imitation of a patented invention which does not copy every literal detail would be to convert the protection of the patent grant into a hollow and useless thing. . . .
>
> The doctrine of equivalents evolved in response to this experience. The essence of the doctrine is that one may not practice a fraud on a patent. . . .
>
> What constitutes equivalency must be determined against the context of the patent, the prior art, and the particular circumstances of the case. Equivalence, in the patent law, is not the prisoner of a formula and is not an absolute to be considered in a vacuum. It does not require complete identity for every purpose and in every respect. In determining equivalents, things equal to the same thing may not be equal to each other and, by the same token, things for most purposes different may sometimes be equivalents. Consideration must be given to the pur-

> pose for which an ingredient is used in a patent, the qualities it has when combined with the other ingredients, and the function which it is intended to perform. An important factor is whether persons reasonably skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was.
>
> A finding of equivalence is a determination of fact. Proof can be made in any form: through testimony of experts or others versed in the technology; by documents, including texts and treatises; and, of course, by the disclosures of the prior art. . . .

Graver Tank & Mfg. Co., Inc. v. Linde Air Products Co., supra, at 607-09.

All of the Elements of the Patent-In-Suit are not present in the Durand-Wayland Machines

As initial matter, it is important to note that the parties agree as to what constitutes the patented invention. The patent-in-suit is for an electrical control system that operates a conveyor. Thus, the claims of the patent cannot be read to cover any more than what is claimed as this particular invention, and the claims cannot be read to cover anything that is inconsistent with what is claimed as this particular invention. *See, e.g., Lockheed Aircraft Corp. v. United States,* 553 F.2d 69, 79 (Ct. C. 1977) (en banc). As was discussed earlier, the claims of the patent describe an electrical control system that operates a cup conveyor capable of sorting fruit by weight or by both weight and color. The machine described in the patent-in-suit employs "hard-wired" components, i.e. shift registers, comparators, shaft encoders, gates, etc. to perform the various functions that sort the fruit.

The Durand-Wayland machines also use a control system that operates a cup conveyor that is capable of sorting fruit by weight only and by both weight and color, but these machines employ a microprocessor(s) instead of "hard-wired" components. Both the machines, described in the patent-in-suit and the "Microsizer" are virtually identical *except* for the control system that conducts the sorting operations. For the reasons discussed below, the Durand-Wayland machines cannot be said to *literally* infringe the patent-in-suit, because these machines do not use the "hard-wired" components or elements which perform the identical functions as those described in the patent-in-suit, and these machines do not make the color decision until after the fruit has arrived at the electronic weight scale (whereas the machine described in the patent-in-suit makes the color comparison while the fruit is in transit from the color detectors to the electronic weight scale). Therefore, if infringement exists, it must be through the "doctrine of equivalents".

The machine described in the patent-in-suit generates a signal proportional to the weight of the item. The "Microsizer" generates a signal proportional to the weight of the item *and* the cup. Thus, the "Microsizer" is more accurate than the machine described in the patent-in-suit, since the "Microsizer" is able to take into account any "foreign" matter that may accumulate inside the cup. The signal that is generated by the "Microsizer" is not proportional (and cannot be made proportional by mathematical computation) to the weight of the fruit.

The machine described in the patent-in-suit compares analog signals with analog reference voltages in order to determine the weight and color data. The "Microsizer" also produces analog signals, but before any comparison takes place, each analog signal is converted to a digital

number. After the conversion takes place and a number is obtained, the "Microsizer" performs a series of subtractions within the software of the microprocessor to determine the weight and color data. Thus, the "Microsizer" does not literally compare signals as described in the patent-in-suit, but rather the "Microsizer" uses mathematical calculations to determine the desired weight and color data. This procedure achieves the same result as does the comparison that is described in the patient-in-suit, although it is a different process.

The machine described in the patent-in-suit uses shift registers that respond to "clock pulses" in order to indicate the various positions of the items to be sorted before each item is discharged. The "Microsizer" does not have any "indicating means" to determine positions of the items to be sorted since the microprocessor stores weight and color data, not the positions of the items to be sorted. After a piece of fruit has been analyzed by the "Microsorter" and while it is in transit from the optical detection means to the weight scale, the color value determined by the "Microsorter" is stored in a color value queue. A color value queue pointer (which changes in value) points to the location of the data corresponding to the next piece of fruit to reach the weight scale. A weight value queue pointer (which also changes in value) is used to correspond to the number of cups between the weight scale and the drop location. The microprocessor software utilizes a random access memory that stores the digital numbers which resulted from the conversion of the analog signals generated by the "Microsorter" and the weight scale, and the queue pointers (under clock control) point to the memory location that has the data about a piece of fruit. The data is never "shifted" around, but rather is just stored in memory until the software routines call for data to be utilized in subsequent portions of the pro-

gram(s). Thus, the "Microsizer" has neither a "first position indicating means" nor a "second position indicating means". The machine described in the patent-in-suit produces signals that indicate where the fruit is, *i.e.* track the progression of each cup. The "Microsizer" does not.

The machine described in the patent-in-suit generates a signal proportional to the color of the item. The "Microsizer" with a "Microsizer" appratus) operates on the amount of light that reflects off of a piece of fruit, and the microprocessor software applies mathematical calculations to the digitized color data in order to sort according to color. The "Microsizer" does not provide a signal which is proportional to the color of a piece of fruit.

The "Microsizer" does not employ substantially the same means as the Patent-In-Suit, nor does the "Microsizer" function in substantially the same way

> In detertmining the question of infringement, it has long been established that the claims of a patent define the metes and bounds of an invention and must be looked to in determining if there has been infringement. . . . However, the scope and breadth of the claimed subject matter must necessarily be established before the question of infringement can be resolved. . . .
>
> It is a corollary of the above that while the specification and drawings of a patent may lend aid in interpreting the claims. . . . the claims of a patent are not limited in scope to the best mode for practicing the invention or to any particular mode for practicing the invention that is described in the specification or drawings. . . . A patent should be accorded a liberal interpretation where it discloses not just an improvement in existing equipment, but rather a different

> route yielding a basic solution to a long-existing problem.

Lockheed Aircraft Corp. v. United States, 553 F.2d at 79 (citations omitted).

The court previously found that the patent-in-suit described a machine capable of sorting fruit by weight and color at high speed with a high degree of accuracy in one operation. However, the machine disclosed in the patent-in-suit was carefully described so that it did not read on the prior art. The disclosed machine is properly characterized as a significant improvement in existing equipment rather than being characterized as a "pioneer" patent. Thus, the court concludes that the claims of the patent should be read in light of the careful phraseology chosen by the investors.

The parties agree that the claims set forth in the patent-in-suit are of the "means for" variety. 35 U.S.C. § 112 governs such claims and provides in pertinent part that

> [a]n element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The court in *Lockheed Aircraft* went on to state that

> [w]hile it is thus essential in clauses which utilize "means" clauses to look to the specification to establish the structure covered thereby, it is also imperative that para. 2 of 35 U.S.C. § 112, which requires that the claims of a patent particularly point out and

> distinctly claim the subject matter that the applicant regards as his invention, not be totally ignored.

553 F.2d at 80-81 (footnote omitted). Thus, the structure disclosed in the patent-in-suit should be looked at and read in conjunction with the "means for" claims in order to decide the scope of the "means for" claims. *Id.* at 81.

When a patent uses "means for" terminology in its claims to set forth

> a means for performing a specific function, without reciting any specific structure for performing that function, the structure disclosed in the specification must be considered, and the patent claim construed to cover both the disclosed structure and equivalents thereof. . . .
>
> * * *
>
> It has often been said that a useful guide in adjudging the equivalency between a claimed and an accused device is whether persons reasonably skilled in the art would have known of the interchangeability of a part in the accused device with one in the claimed device. . . .

Id. at 82.

The expert witnesses in this action all agreed that microprocessors were on the market at the time the patent-in-suit was applied for. However, all of the expert witnesses stated that the microprocessors on the market in the early and middle 1970's were less powerful and more costly than the microprocessors which became available in the late 1970's and early 1980's. The evidence brought forward by both parties also shows that a microprocessor has no utility without properly function-

ing "software". It is a microprocessor's "software" that controls the operation of the computer, and in the case of the "Microsizer", it is the "software" that determines the weight data, color data (if a "Microsorter" is present) and the particular drop locations.

Therefore, the court's inquiry becomes two-fold: do the "means for" claims of the patent-in-suit include the use of microprocessing computers; and if so, is the particular microprocessing computer used in the "Microsizer" the legal equivalent of the "hard-wired" components described in the patent-in-suit.

Durand-Wayland argues that since Warkentin and Mills were aware of microprocessors before they applied for the patent-in-suit, Warkentin and Mills elected to limit the "means for" claims of the patent to "hard-wired" components. Based on the evidence as well as the applicable law, Durand-Wayland's argument is incorrect.

It is fundamental that an inventor need only disclose the best mode conceived by him for practicing the invention, not all conceivable modes, and it has long been settled that infringement is not avoided by an equivalent that was not known at the time of the invention. *Id.* at 83-84. The evidence at trial indicated that Warkentin and Mills were aware of microprocessors in general, but that they never attempted to operate a sorter using a microprocessor or even thought about doing so. Warkentin and Mills did not elect to limit the scope of their invention and did in fact assert "means for" claims in their patent application. The court ruled earlier that the best mode of the invention known to the inventors was disclosed in the patent's application, and that the particular claims of the patent should be accorded an interpretation consistent with words of the claims and the prior art. Neither the language of claims of the patent nor the prior

art require that the claims of the patent-in-suit be read to include only those devices that use the components described in the patent-in-suit's claims and specification. Accordingly, the court concludes that the "means for" claims of the patent-in-suit are not limited to "hard-wired" components and can be read to include microprocessing computers that are the legal equivalent of the disclosed "hard-wired" components.

Before turning the inquiry to whether the particular microprocessing computer used in the "Microsizer" (as well as the microprocessing computer used in the "Microsorter" when that apparatus is present) infringes the "means for" claims of the patent-in-suit, it is important to keep in mind the words of the Supreme Court on the "doctrine of equivalents":

> The wholesome realism of this doctrine is not always applied in favor of a patentee but is sometimes used against him. Thus, where a device is so far changed in principle from a patented article that it performs the same or a similar function in a substantially different way, but nevertheless fails within the literal words of the claim, the doctrine of equivalents may be used to restrict the claim and defeat the patentee's action for infringement. *Westinghouse v. Boyden Power Brake Co.,* 170 U.S. 537, 568. In its early development, the doctrine was usually applied in cases involving devices where there was equivalence in mechanical components. Subsequently, however, the same principles were also applied to compositions, where there was equivalence between chemical ingredients. Today the doctrine is applied to mechanical or chemical equivalents in compositions or devices.

Graver Tank and Mfg. Co., Inc. v. Linde Air Products Co., supra, at 608-09.

As has been stated earlier, Pennwalt alleges that the microprocessor(s) and the "software" operating it are the legal equivalents of the "hard-wired" components described in the patent-in-suit. Durand-Wayland argues to the contrary. For the reasons set forth below, the court concludes that the elements used in the Durand-Wayland machines are not the legal equivalents of the components disclosed in the patent-in-suit.

The court earlier quoted language from *Lockheed Aircraft* which states the test for adjudging the equivalency between a claimed invention and an accused device. In determining the level of skill in the art of sorting items to decide whether the average artison would have known of the interchangeability of the microprocessor(s) found in the "Microsizer" with the "hard-wired" logic circuitry disclosed in the patent-in-suit, it is important to remember the past history of this particular art. The sorting industry developed in the 1950's and early 1960's around machines that were mechanical in nature, e.g. MUMMA. By the middle 1960's, the sorting machines were electromechanical in nature, e.g. ROBERTS. By the early 1970's, the sorting machines began to include electronic designs, e.g. McCLURE. By the middle and late 1970's, the machines began to include electronic and logic circuit design, e.g. the patent-in-suit. Then in the last several years as microprocessing computers became available, machines began to use microprocessors to analyze data, e.g. the "Microsizer."

Although the alleged equivalent device need not have been known or in existence at the time the patent was applied for, *Lockheed Aircraft Corp. v. United States,* 553 F.2d 69, 84 (Ct. Cl. 1977) (en banc), after the alleged equivalent device does become available, the average artison in the particular field should know if its inter-

changeability with the components disclosed in the patent if equivalency is to be found. *Hughes Aircraft Company v. United States,* 717 F.2d 1351, 1364-65 (Fed. Cir. 1983.)

All of the elements found in the patent-in-suit are not present in the "Microsizer", although the claims of the patent-in-suit are broad enought to include microprocessing computers. Thus, because the "Microsizer" uses different elements and different operations (on the elements it does use) than the elements and operations disclosed in the patent-in-suit to achieve the desired results, infringement can only be found if the different elements and operations are the legal equivalents of those disclosed in the patent-in-suit.

The court concludes that the average artison in the sorting field would not have known of the interchangeability of microprocessors (with appropriate "software") and the electronic and logic circuit design disclosed in the patent-in-suit, and that the "Microsizer" functions in a substantially different manner than does the machine disclosed in the patent-in-suit, and that the "Microsizer" functions in a substantially different manner than does the machine disclosed in the patent-in-suit. As was seen in the prior art referenced against the patent-in-suit by the patent examiner and Durand-Wayland, electromechanical machines took the place of mechanical machines by using different elements to perform functions in a substantially different manner. Likewise, machines utilizing electronic and logic circuit design took the place of electromechanical machines by using different elements to perform functions in a substantially different manner. The prior art of the sorting industry indicates that when the technology changes not only do the elements used in sorting machines change, but also the operations of the machines change significantly and substantially. Although the de-

sired result may remain the same, the functions performed and operations employed by the machines to achieve the desired result change significantly.

The record in this action shows that although the average artisan in the sorting art may well have been aware that the technology had changed from electronic and logic circuitry to microprocessors, he was not aware of the new elements, functions and operations that had to be developed in order to successfully implement a microprocessor based sorting machine. In a microprocessor based machine, signals that represent weight and color data must be digitized and analyzed mathematically by "software" instead of the comparison of signals to reference signals used in the electronic and logic circuitry based machines. The average artisan in the art was not aware of the interchangeability of microprocessors (with appropriate "software") with "hard-wired" components. The manner in which the "Microsizer" makes its decision on where to drop the fruit is not substantially the same as the manner disclosed in the patent-in-suit, because the "Microsizer" employs different operations and methods to perform different functions. The control system used by the "Microsizer" generates weight data (and if a "Microsorter" is used, color data) by digitizing analog signals, and this data is sorted and analyzed by a microprocessor(s) that utilizes special "software" capable of operating the machine in a way that drops fruit of the same weight (or same weight and color) at the same drop location. The control system disclosed in the patent-in-suit achieves the same result, but the functions performed (generating electronic signals proportional to the weight or color of the fruit) and the operation employed (data analyzed by circuitry) are different. Inasmuch as the average artisan in the sorting industry would not have known of the interchangeability of the microprocessor(s)

and its software with the electronic and logic circuitry disclosed in the patent-in-suit, the elements of the "Microsizer" are not the legal equivalents of the components disclosed in the patent-in-suit.

The court accords the unbiased, well-qualified and scholarly opinion of Dr. Vacroux great weight. However, (perhaps because of the limitations on the court's technical expertise, knowledge and understanding in the fields involved) the court is unable to adopt the position of Dr. Vacroux that the machines in question are the functional equivalents of each other. To the contrary, the court concludes that the differences in the Durand-Wayland's machines are substantial and significant enough to escape a charge of infringement by Pennwalt. Accordingly, the court concludes that the Durand-Wayland machines do not infringe the patent-in-suit.

CONCLUSION

For the reasons set forth above, the court hereby concludes that United States Patent No. 4,106,628 is valid, and that the "Microsizer" utilizing software labelled either Version 2 or Version 5 and the "Microsizer" with the "Microsorter" apparatus utilizing software labelled Version 6 manufactured by Durand-Wayland, Inc. do not infringe upon United States Patent No. 4,106,628. The court hereby orders counsel for both parties to submit an order consistent with the above opinion and a memorandum setting forth the issues that remain in this action within thirty (30) days of the date of this opinion.

SO ORDERED, this 22 day of March, 1984.

G. ERNEST TIDWELL
Judge, United States
District Court

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF GEORGIA
NEWNAN DIVISION

PENNWALT CORPORATION
v.
DURAND-WAYLAND, INC.

Civil Action No. C80-114N

ORDER

Received: May 9, 1984 — Seidel, Gonda & Goldhammer,
P.C.
Filed: April 30, 1984 — Ben H. Carter, Clerk

In an order dated March 22, 1984, this court found United States Patent No. 4,106,628 (hereinafter referred to as "the patent" or "the patent-in-suit") to be valid but not infringed by the machines manufactured by defendant Durand-Wayland, Inc. Presently before the court is Pennwalt Corporation's motion for supplemental findings of fact and conclusions of law.

In its motion, Pennwalt contends that the court's March 22, 1984 order implicitly found that the patent-in-suit was not obvious, but in order to perfect the record for appeal such a finding must be express. Durand-Wayland contends that the court did not address the question of obviousness in the March 22, 1984 order, but does agree with Pennwalt that the court should make additional findings of fact and conclusions of law on the issue of obviousness.

The Supreme Court, in *Graham v. John Deere Co.*, 383 U.S. 1 (1966), set forth the factual determinations a trial court must make in order to decide whether or not a patent is obvious:

> Under [35 U.S.C.] § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined.

Id. at 17.

On pages 13-19 of the court's March 22, 1984 order, the scope and content of the prior art were discussed and determined; on pages 26-30, the differences between the prior art and the claims at issue were ascertained; and on pages 32-33 and 46-47, the level of ordinary skill in the fruit sorting field was resolved. The court agrees with Pennwalt that pages 32-33 and 46-47 of the March 22, 1984 order implicitly found that the patent-in-suit was not obvious, and the court now makes that finding explicit.

Based upon the factual findings made in the March 22, 1984 order as to the scope and content of the prior art, the differences between the prior art and the claims at issue and the level of ordinary skill in the fruit sorting field (referenced above), the court concludes that the patent-in-suit was not obvious. 35 U.S.C. § 103 requires that the claims of a patent be declared invalid only when the invention set forth in those claims can be said to "have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." As the court stated on page 32 of the March 22, 1984 order, how to get and analyze color and weight data from electronic scales and optical detection means was not common knowledge in the fruit sorting field at the time of the invention disclosed in the claims of the patent-in-suit. Accordingly, the court con-

cludes and hereby expressly finds that the patent-in-suit was not obvious and is not invalid under 35 U.S.C. § 103.

The March 22, 1984 order also ordered counsel for both parties to submit a memorandum setting forth the issues that remain in this action. In their joint memorandum of remaining issues, counsel for both parties agree that only issues remaining in this action are as follows:

> (1) Whether Durand-Wayland, Inc. is entitled to an award of costs under Rule 54(d), Fed. R. Civ. P., or whether each party shall bear its own costs?
>
> (2) Whether Durand-Wayland, Inc. is entitled to an award of attorney's fees under 35 U.S.C. § 285, or whether each party shall bear its own attorney's fees?

Inasmuch as counsel for both parties agree that these are the only issues remaining in this action, the court hereby orders that each party submit briefs (and other documents if necessary) on these two issues within thirty (30) days of the date of this order. In the alternative, the parties may wish to agree on a different time schedule for the resolution of the remaining issues. Therefore, the court orders that each party submit either briefs on these two issues or a joint memorandum setting forth a time schedule for resolving these two issues within thirty (30) days of the date of this order. The Clerk of this Court is directed to submit this file at the end of the thirty (30) day period.

SO ORDERED, this 26 day of April, 1984.

G. ERNEST TIDWELL
Judge, United States
District Court

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT
OF GEORGIA
NEWNAN DIVISION

PENNWALT CORPORATION

v.

DURAND-WAYLAND, INC.

Civil Action No. C80-114N

ORDER

Received: Nov. 21, 1984 — Seidel, Gonda & Goldhammer, P.C.
Filed: Nov. 19, 1984 — Ben H. Carter, Clerk

The above-styled action is presently before this court on the defendant's motion for an award of costs and attorney fees. After a trial to the court, this court determined that the plaintiff's patent was valid and that the defendant did not infringe the patent. The plaintiff opposes the defendant's motion, contending that the defendants is not a prevailing party because its patent was declared valid.

Under Rule 54(d), Fed. R. Civ. P., a prevailing party is entitled to costs unless the court otherwise directs. To be a prevailing party, a party must obtain some relief, even though it need not succeed on all its claims. *See United States v. Mitchell,* 580 F.2d 789, 793 (5th Cir. 1978). In the present case, the plaintiff did not obtain any of the relief requested, and the defendant successfully defended against the plaintiff's claim of infringement. The defendant is thus the prevailing party. Although Rule 54(d) does not prevent a trial court from requiring a prevailing party to bear its own costs, a prevailing party is prima facie entitled to costs, and the losing party must over-

come this presumption because the denial of costs would be similar to a penalty. *See Gilchrist v. Bolger,* 733 F.2d 1551, 1557 (11th Cir. 1984). Because the plaintiff has failed to overcome this presumption, this court sustains and grants the defendant's request for costs.

Section 285 of 35 U.S.C. provides that the court in exceptional circumstances may award reasonable attorney fees. The award of attorney fees is discretionary and is granted upon a finding of unfairness, bad faith,, inequitable conduct, vexations litigation, or other exceptional circumstances. *See Hughes v. Novi American, Inc.,* 724 F.2d 122, 125 (Fed. Cir. 1984); *Stevenson v. Sears, Roebuck & Company,* 713 F.2d 705, 713 (Fed. Cir. 1983).

In considering the circumstances of this case, this court does not find that the plaintiff acted in bad faith, nor does it find any support for findings of unfairness, inequitable conduct, vexatious litigation, or other circumstances that would warrant a finding of exceptional circumstances. The defendant's request for attorney fees is therefore overruled and denied.

In summary, the defendant's request for costs is hereby sustained and granted, and the defendant's request for attorney fees is overruled and denied.

SO ORDERED, this 15 day of November, 1984.

G. ERNEST TIDWELL
Judge, United States
District Court

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF GEORGIA
NEWNAN DIVISION

PENNWALT CORPORATION,
Plaintiff,

v.

DURAND-WAYLAND, INC.
Defendant.

Civil Action No. C80-114N

FINAL JUDGMENT

Filed: Dec. 28, 1984 Ben H. Carter, Clerk

For the reasons set forth in the Court's Opinion dated March 22, 1984, as amended by order dated April 26, 1984.

1. Judgment is hereby entered in favor of defendant declaring that claims 1 and 2 of U.S. Patent, 4,106,628 are not infringed by defendant's "Microsizer" article sorting apparatus equipped with any of defendant's Version 2, Version 5 or Version 6 software and that claims 1, 2, 10 and 18 are not infringed by defendant's Microsizer article sorting apparatus equipped with defendant's "Microsizer" color sorting apparatus and Version 6 software.

2. Judgment is hereby entered in favor of plaintiff declaring that defendant has not met its burden of showing that any of claims 1, 2, 10 and 18 of U.S. Patent 4,106,628 is invalid.

For the reasons set forth in the Court's Order dated November 15, 1984.

3. Judgment is hereby entered in favor of defendant granting defendant's request for recovery of its costs. Accounting of defendant's costs shall be deferred until the final disposition of all appeals from this Final Judgment.

4. Judgment is hereby entered in favor of plaintiff denying defendant's request for recovery of its attorney fees.

It is so ORDERED this 28 day of December, 1984.

G. ERNEST TIDWELL
United States District Judge

EDITOR'S NOTE

THE FOLLOWING PAGES WERE POOR HARD COPY AT THE TIME OF FILMING. IF AND WHEN A BETTER COPY CAN BE OBTAINED, A NEW FICHE WILL BE ISSUED.

Supreme Court, U.S.
FILED
FEB 24 1988
JOSEPH F. SPANIOL, JR.
CLERK

(3)

87-1450

No. 87-1228

In the Supreme Court
OF THE
United States

OCTOBER TERM, 1987

PENNWALT CORPORATION
Petitioner,
VS.
DURAND-WAYLAND, INC.,
Respondent,
Cross-Petitioner.

APPENDIX II

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23 pp

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Invoice Order A-196

Williamson Memorandum A-198

United States Patent [19]
Conway et al.

[11] 3,768,645
[45] Oct. 30, 1973

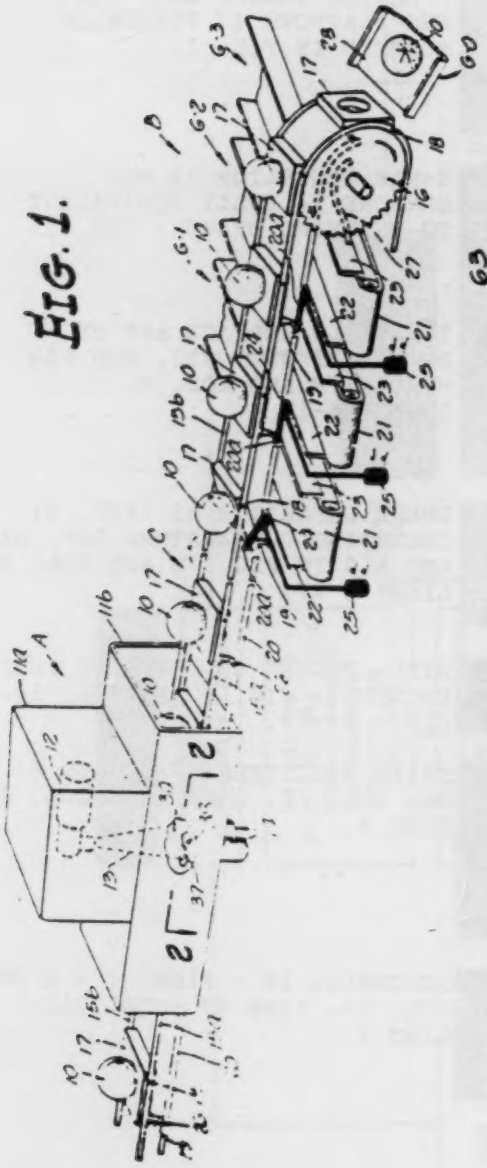


FIG. 1.

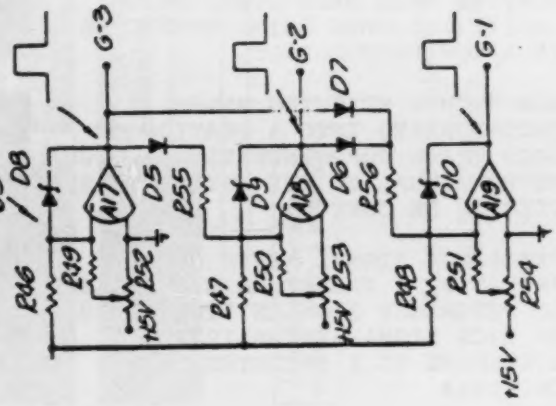


FIG. 7B.

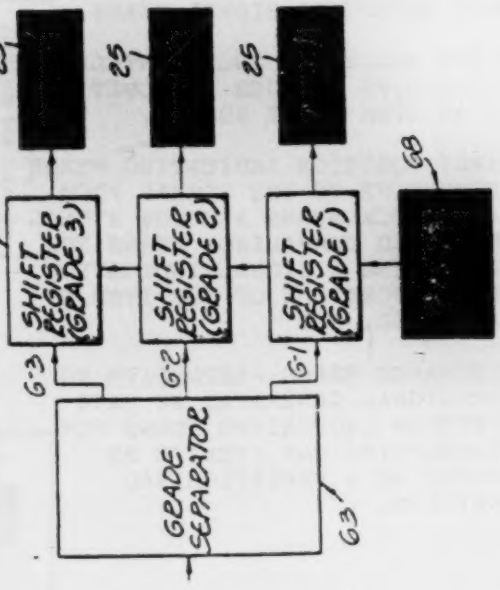
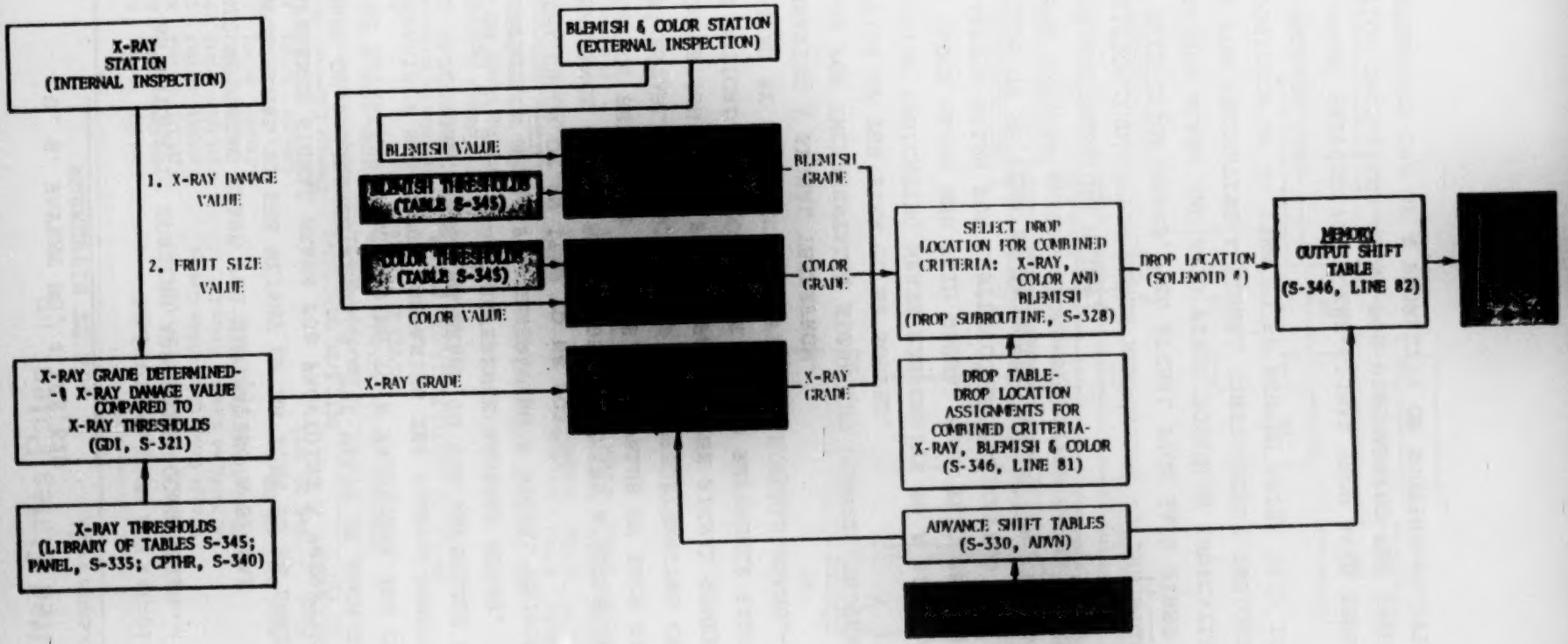


FIG. 6.

U.S. PATENT NO. 4,106,628 WARKENTIN ET AL.	U.S. PATENT NO. 3,768,645 CONWAY ET AL.
1. AN AUTOMATIC SORTING APPARATUS COMPRISING	
(1) CONVEYANCE MEANS FOR TRANSPORTING A PLURALITY OF ITEMS TO BE SORTED ALONG A TRACK AND HAVING INDIVIDUAL CUPS FOR TRANSPORTING EACH SAID ITEM, SAID INDIVIDUAL CUPS BEING CONNECTED IN A CONTINUOUS BELT,	FRUIT 10 ALONG CONVEYOR C HAVING CHAINS 15A, 15B AND PLATFORM 17 PIVOTALLY MOUNTED IN FIG. 1.
(2) ELECTRONIC WEIGHING MEANS INCORPORATED INTO A PORTION OF SAID TRACK FOR GENERATING A SIGNAL PROPORTIONAL TO THE WEIGHT OF SAID ITEM TO BE SORTED,	X-RAY GENERATOR 12 AND SENSORS 14 FULLY EQUIVALENT TO WEIGHING MEANS - FIG. 1.
(3) REFERENCE SIGNAL MEANS FOR PROVIDING A PREDETERMINED NUMBER OF REFERENCE SIGNALS, THE VALUE OF EACH SIGNAL ESTABLISHED ACCORDING TO A PREDETERMINED CRITERIA,	THRESHOLD VOLTAGE SET BY RESISTORS R52, R53, AND R54 - FIG. 7B AND COL. 9, LINES 14-18
(4) COMPARISON MEANS FOR COMPARING THE SIGNAL GENERATED BY SAID ELECTRONIC WEIGHING MEANS TO THE REFERENCE SIGNALS PROVIDED BY SAID REFERENCE SIGNAL MEANS,	GRADE SEPARATOR 63 (FIG. 6) INCLUDING COMPARATORS A17, A18 AND A19 IN FIG. 7B AND COL. 9, LINES 6-47.
(5) CLOCK MEANS FOR INCREMENTALLY SIGNALLING CHANGES IN POSITION OF AN ITEM TO BE SORTED,	SYNC. PULSER 68, OPTICAL SHAFT ENCODER - FIG. 6 AND COL. 10, LINES 53-67.
(6) FIRST POSITION INDICATING MEANS RESPONSIVE TO THE SIGNAL FROM SAID CLOCK MEANS AND THE SIGNAL FROM SAID COMPARISON MEANS FOR GENERATING A SIGNAL INDICATIVE OF THE POSITION OF THE ITEM TO BE SORTED, AND	SHIFT REGISTERS 67 - FIG. 6 AND COL. 10, LINE 39 - COL. 11, LINE 4.
(7) DISCHARGE MEANS RESPONSIVE TO THE SIGNAL GENERATED BY SAID POSITION INDICATING MEANS FOR DISCHARGING THE ITEM TO BE SORTED AT A PREDETERMINED POSITION.	SOLENOIDS 25 - FIGS. 1 & 6 AND COL. 10, LINE 67 - COL. 11, LINE 4.

SUNKIST ELECTROMECHANICAL GRADER (EMG)

CORONA COLLEGE HEIGHTS (CCH), FALL 1974



U. S. PATENT NO. 4,106,628
WARKENTIN ET AL.

10. AN AUTOMATIC SORTING APPARATUS COMPRISING

[redacted] ELECTRONIC WEIGHING MEANS FOR GENERATING A SIGNAL PROPORTIONAL TO THE WEIGHT OF AN ITEM TO BE SORTED,

[redacted] (2) FIRST REFERENCE SIGNAL MEANS FOR PROVIDING A PREDETERMINED NUMBER OF REFERENCE SIGNALS, THE VALUE OF EACH SIGNAL BEING ESTABLISHED ACCORDING TO A PREDETERMINED CRITERIA,

[redacted] FIRST COMPARISON MEANS FOR COMPARING THE SIGNAL GENERATED BY SAID ELECTRONIC WEIGHING MEANS TO THE REFERENCE SIGNALS PROVIDED BY SAID FIRST REFERENCE SIGNALS MEANS,

[redacted] OPTICAL DETECTION MEANS FOR GENERATING A SIGNAL PROPORTIONAL TO THE COLOR OF AN ITEM TO BE SORTED,

[redacted] SECOND REFERENCE SIGNAL MEANS FOR PROVIDING A PREDETERMINED NUMBER OF REFERENCE SIGNALS, THE VALUE OF EACH SIGNAL BEING ESTABLISHED ACCORDING TO A PREDETERMINED CRITERIA,

[redacted] SECOND COMPARISON MEANS FOR COMPARING THE SIGNAL GENERATED BY SAID OPTICAL DETECTON MEANS TO THE REFERENCE SIGNALS PROVIDED BY SAID SECOND REFERENCE SIGNALS MEANS, AND GENERATING A SIGNAL THEREFROM,

[redacted] CLOCK MEANS FOR INCREMENTALLY SIGNALING CHANGES IN THE POSITION OF THE ITEM TO BE SORTED,

[redacted] FIRST POSITION INDICATING MEANS RESPONSIVE TO A SIGNAL FROM SAID CLOCK MEANS AND SAID SIGNAL FROM SAID SECOND COMPARISON MEANS FOR CONTINUOUSLY INDICATING THE POSITION OF AN ITEM TO BE SORTED WHILE THE ITEM IS IN TRANSIT BETWEEN SAID OPTICAL DETECTION MEANS AND SAID ELECTRONIC WEIGHING MEANS,

[redacted] SECOND POSITION INDICATING MEANS RESPONSIVE TO THE SIGNAL FROM SAID CLOCK MEANS, THE SIGNAL FROM SAID FIRST COMPARISON MEANS AND SAID FIRST POSITION INDICATING MEANS FOR GENERATING A SIGNAL CONTINUOUSLY INDICATIVE OF THE POSITION OF AN ITEM TO BE SORTED AFTER SAID ITEM HAS BEEN WEIGHED, AND

[redacted] DISCHARGE MEANS RESPONSIVE TO THE SIGNAL FROM SAID SECOND POSITION INDICATING MEANS FOR DISCHARGING THE ITEM AT A PREDETERMINED ONE OF A PLURALITY OF SORTING POSITIONS.

,106,628 **United States Patent** [19]

Warkentin et al.

[11] **4,106,628**

[45] **Aug. 15, 1978**

[54] **SORTER FOR FRUIT AND THE LIKE**

[76] Inventors: Aaron J. Warkentin, 13551 View Dr., Orange Cove, Calif. 93646; George A. Mills, 44 Kaweah River Dr., Three Rivers, Calif. 93271

[21] Appl. No.: 659,898

[22] Filed: Feb. 20, 1976

[51] Int. Cl.[2] B07C 5/28; B07C 5/342

[52] U.S. Cl. ..... 209/74 M; 209/75; 209/111.6; 209/121; 177/145; 356/178; 250/223 R; 250/226

[58] Field of Search ..... 209/74 M, 75, 111.6, 209/121, 73; 250/223 R, 225, 226; 356/178, 186; 177/145, 211

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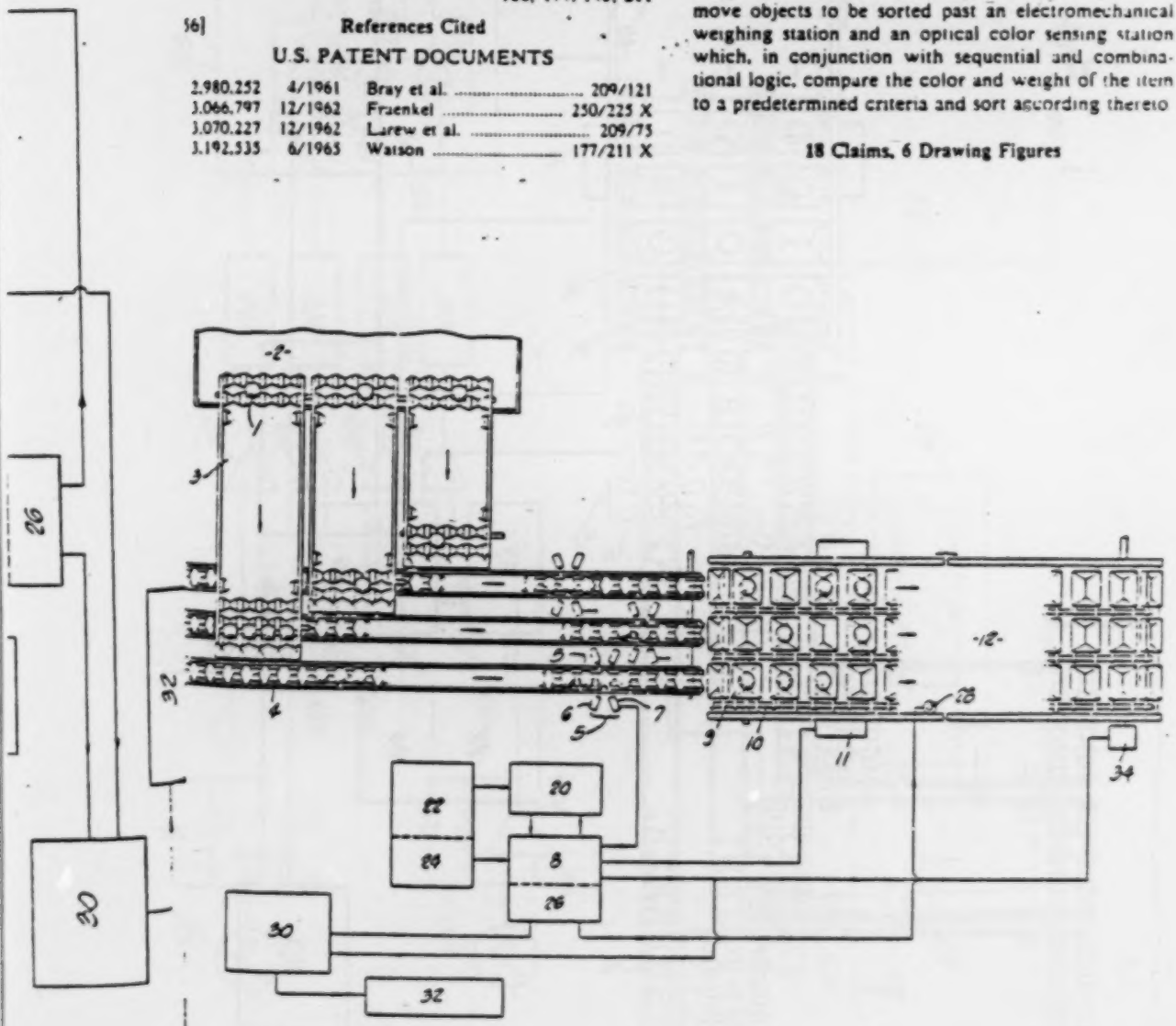
Primary Examiner—Robert B. Reeves
Assistant Examiner—Joseph J. Rolla
Attorney, Agent, or Firm—Lyon & Lyon

[57] **ABSTRACT**

Apparatus for automatically sorting fruit and the like by weight or color, or both, using conveyance system to move objects to be sorted past an electromechanical weighing station and an optical color sensing station which, in conjunction with sequential and combinational logic, compare the color and weight of the item to a predetermined criteria and sort according thereto

18 Claims, 6 Drawing Figures



U.S. Patent Aug. 15, 1978 Sheet 1 of 5 4,106,628

FIG. 1.

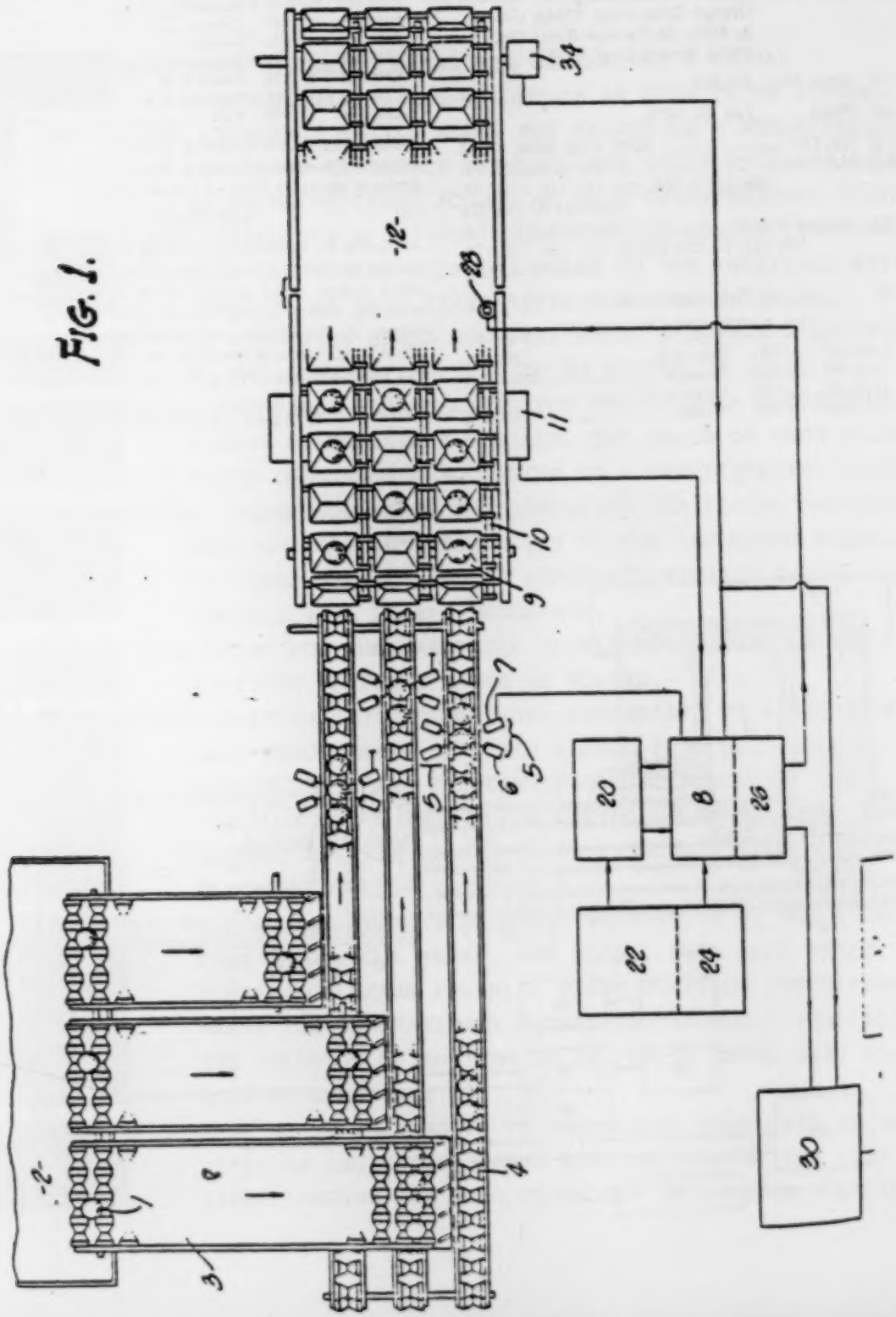
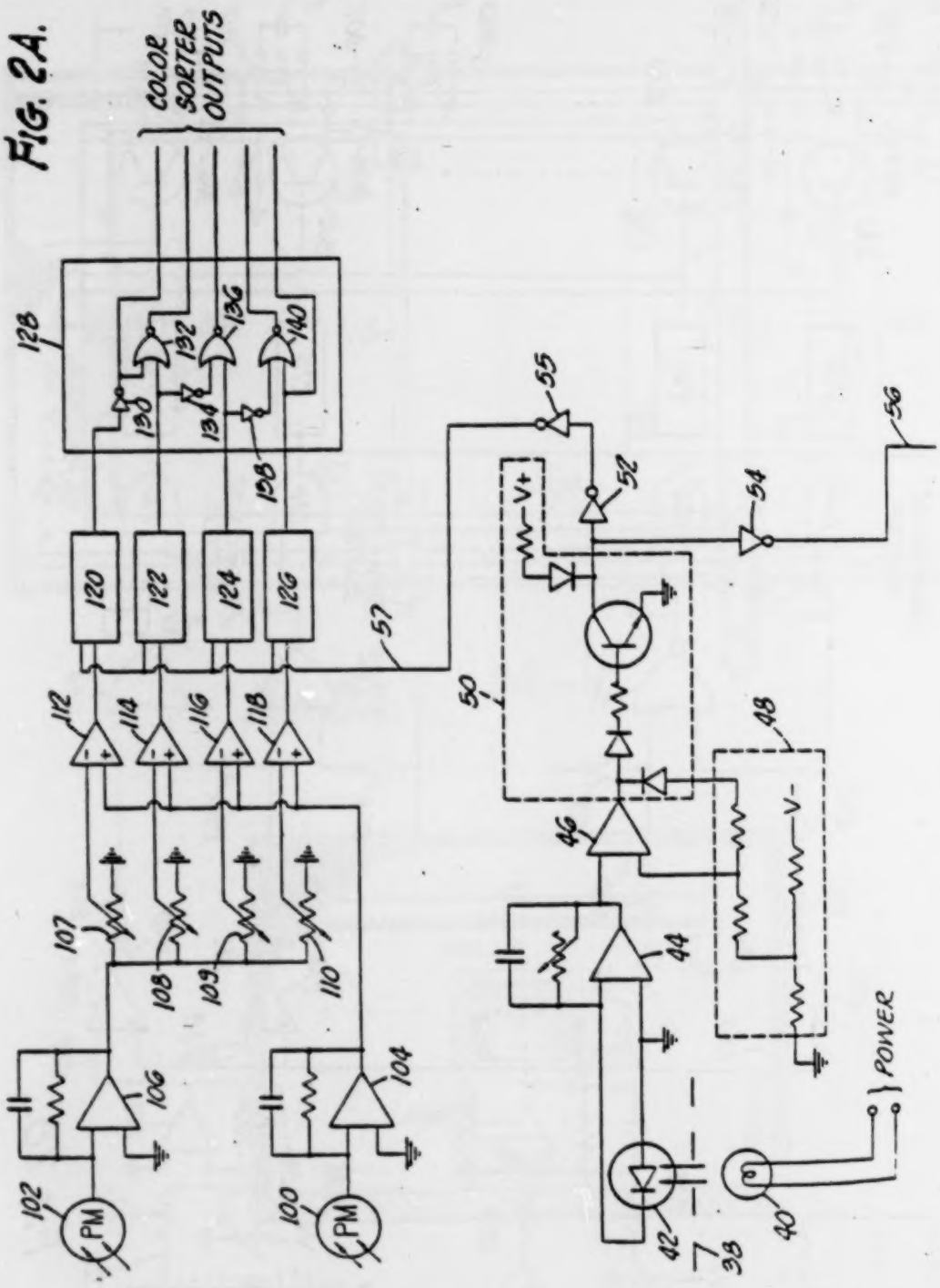


FIG. 2A.


COLOR SORTER OUTPUTS
128
130
132
134
136
138
140
120
122
124
126
57
55
52
54
56
V+
50
48
V-
46
44
112
114
116
118
107
108
109
110
106
104
102
100
PM
PM
POWER
42
38
40

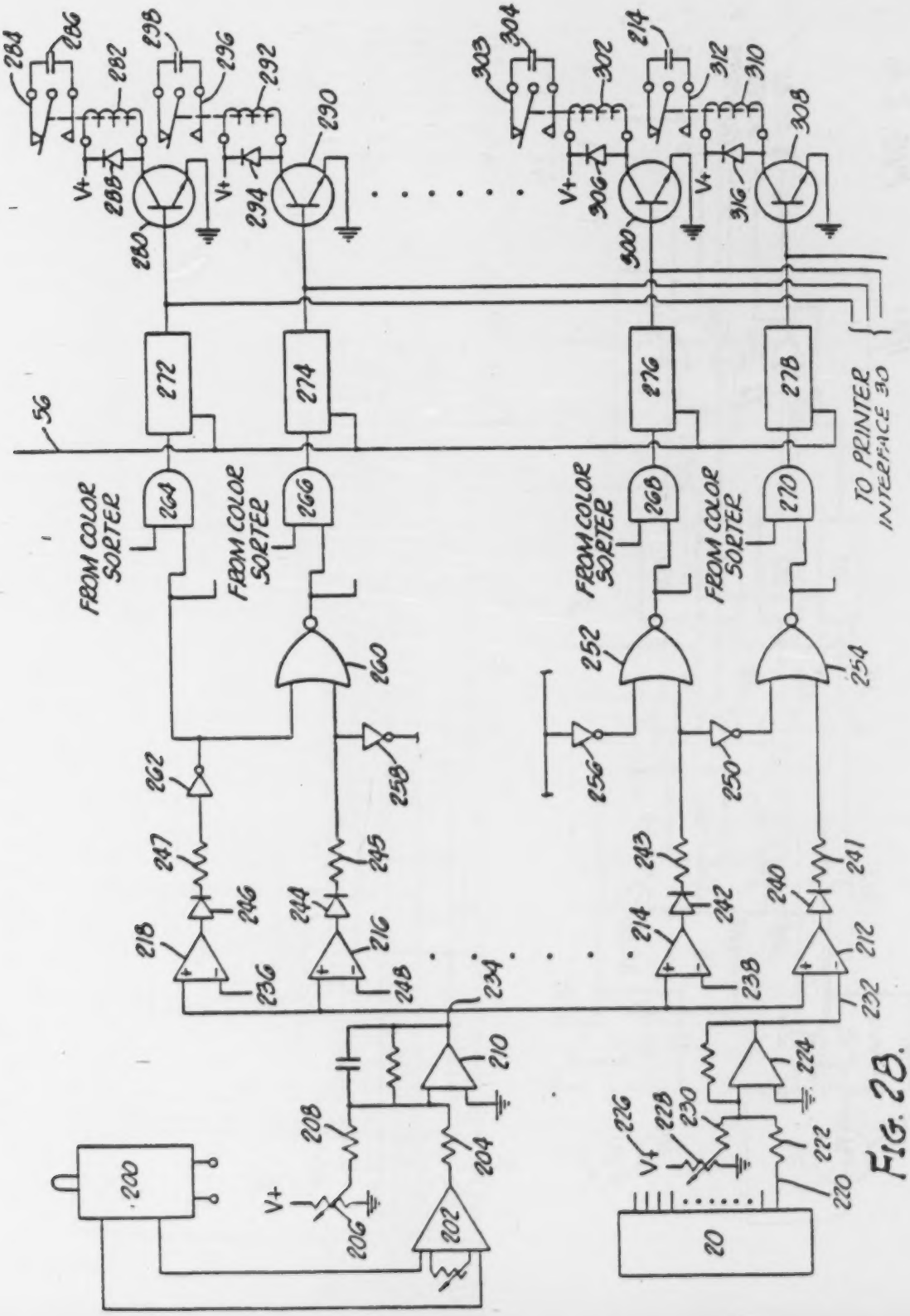

FROM COLOR SORTER
FROM COLOR SORTER
FROM COLOR SORTER
FROM COLOR SORTER
TO PRINTER INTERFACE 30
56
V+
20
200
202
206
208
210
220
222
224
226
228
230
232
234
236
238
240
241
242
243
244
245
246
247
248
250
252
254
256
258
260
262
264
266
268
270
272
274
276
278
280
282
284
286
288
290
292
294
296
298
300
302
303
304
306
308
310
312
314
316

FIG. 2B.

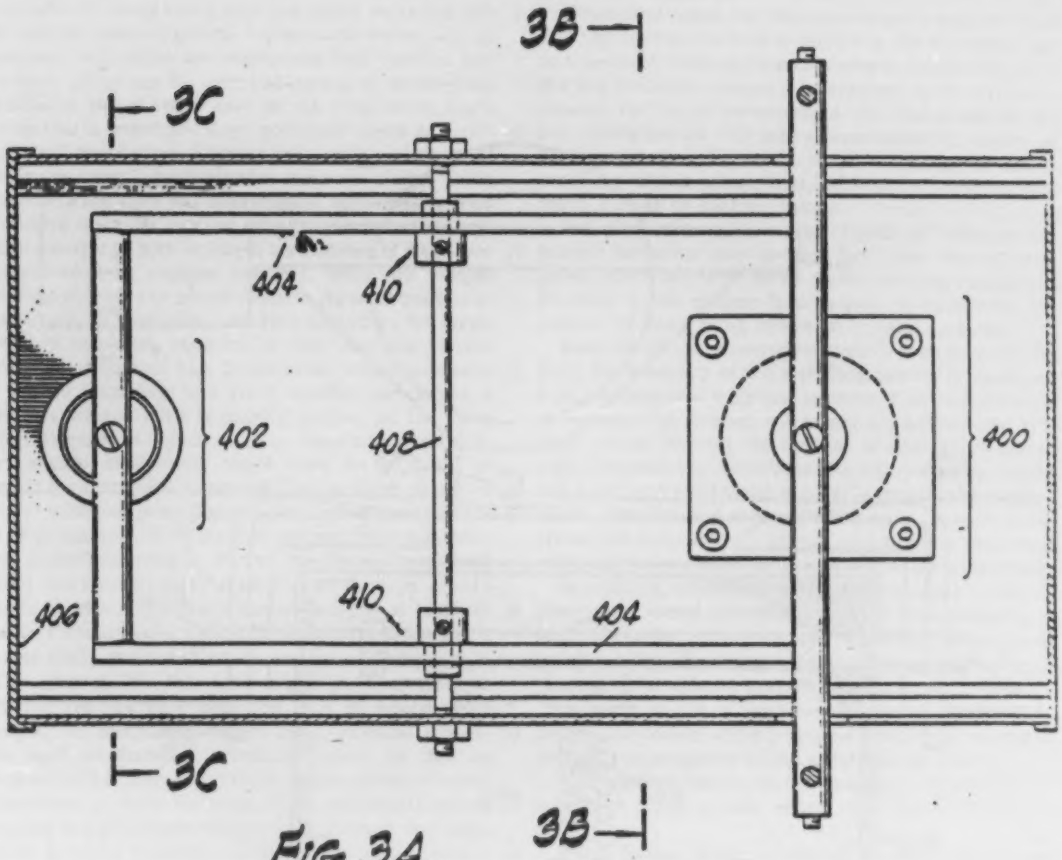

3B
3C
404
410
402
408
400
406
410
404
3C
3B

FIG. 3A.

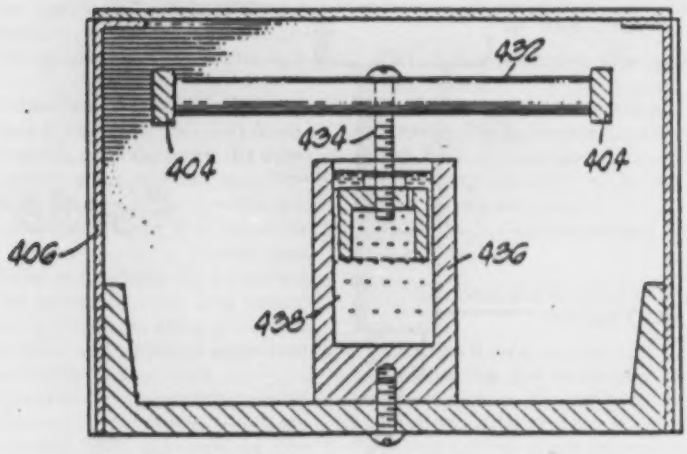

432
434
404
404
406
436
438

FIG. 3C.

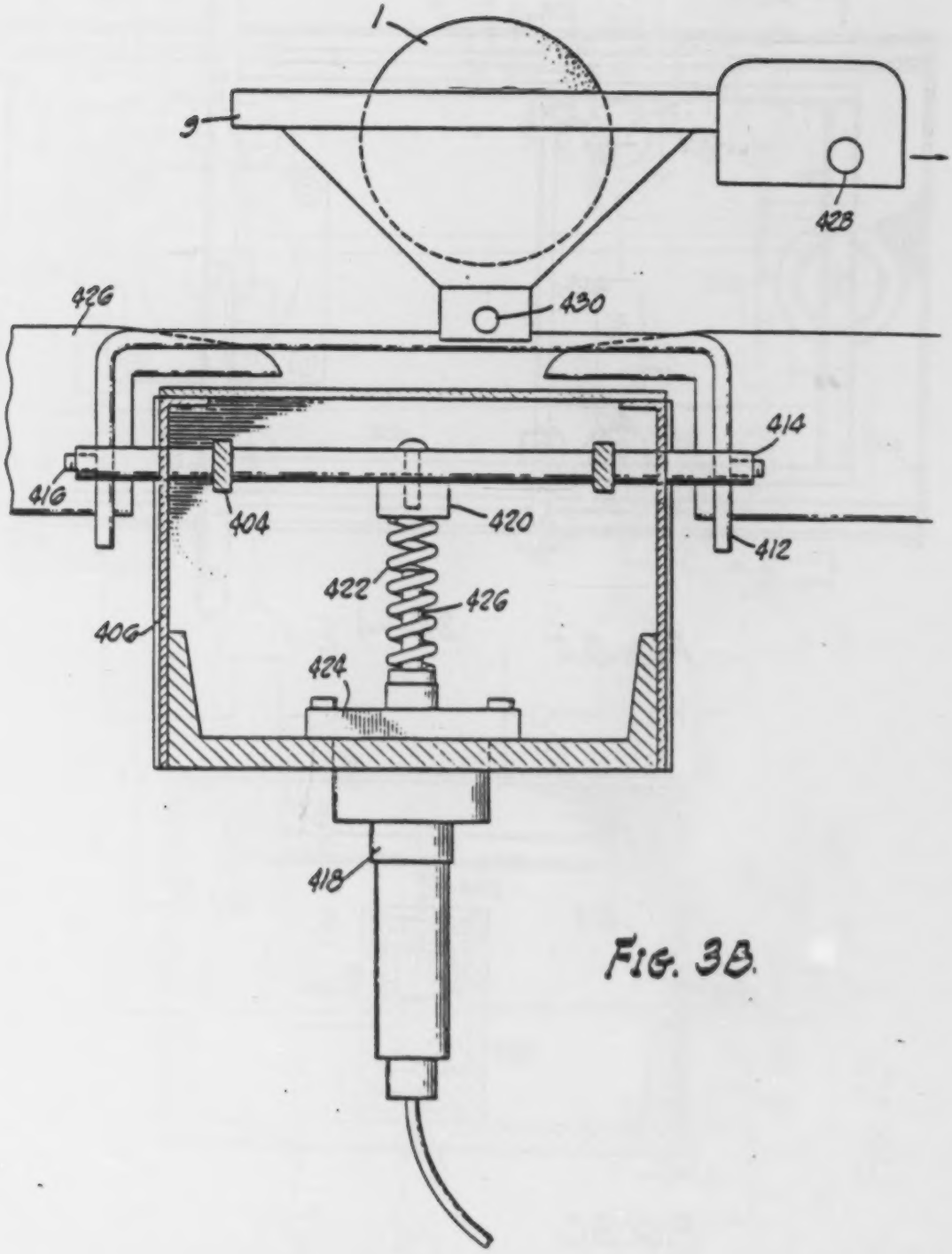


FIG. 3B.

SORTER FOR FRUIT AND THE LIKE

BACKGROUND OF THE INVENTION

Automated sizing equipment segregate incoming lots into various size categories. Agricultural items such as fruits and vegetables are segregated into various size and color groupings for later packaging, or processing, distribution and eventual sale on the retail level. Such segregation is important since packaged items of a certain "size" may have a different value than a package of a different "size." Additionally, since lot dollar value depends on the item size distribution, growers are paid depending upon the number of items in each category.

Size groupings may be based on number of items per volume—such as number per box, with box weight open—or number per pound—that is, number per box at a fixed weight. Typically, limits are placed on the maximum and minimum variation in fruit size and weight allowable within one box. In addition, where products are packed according to a given number per carton, a minimum weight limit is usually placed on the total carton. In order to account for the fluctuation item size, conventional mechanical sizers must be adjusted to provide for somewhat oversized fruit in order to assure that the minimum poundage per package requirement in met. For example, if 40 pounds per carton is the minimum acceptable weight, it may be that conventional sorting machinery must be set for an average of 41¼ pounds to assure that each carton weighs at least 40 pounds. Consequently, a substantial amount of the items are essentially given away.

The reasons for this inaccuracy in conventional weighing systems vary with the type of system. For example, for mechanical sizers using physical dimensions such as diameter, variation could be due to changes in either shape or density within the lot of items to be sorted or from lot to lot. For mechanical spring weighing sizing systems, temperature change, the large number of scales required, vibration, and item positioning may cause inaccurate segregation. With either type system, the inaccuracies inherent in the system itself require that a substantial amount of fruit be given away.

SUMMARY OF THE INVENTION

The present invention relates to automatic sorting devices and, more particularly, to devices for automatically sorting fruit or other goods according to size and/or color.

The present invention uses belt or roller conveyors to receive incoming fruit and channel the fruit into multiple separate, single fruit width, adjacent lanes, the number of lanes being dependent upon machine size. The fruit or other object travels single file on the separate, single fruit width, roller conveyor. On this conveyor the fruit is channeled through a color scanner box where each item is viewed sequentially by an optical detection device for that particular lane. The optical detection device basically averages the color of the two opposite sides of the product and, through associated logic, classifies the object according to color.

The single lane, or singulator, conveyor then conveys the fruit onto a corresponding lane of cups, which are attached to conveyor chains, each cup holding one item. The cups are moved by the conveyor chain over a section of the rail attached to an electronic scale. Each cup with its fruit contents is weighed, and the resulting signal is operated on by logic circuitry to categorize the

item of fruit into a predetermined number of categories. The weight category may be combined with the color categories, or used separately, to determine the product's final disposition.

Depending upon the selection criteria programmed into the system, the fruit is carried in the conveyor cup to a series of dropout locations where, depending upon the size and color category determined by the selection criteria, the cup is permitted to tilt. The tilting of the cup discharges the fruit into a predetermined storage or packing location. Typically, the lanes are comprised of cross-conveyors which lead the fruit to various automatic storage or packing means.

A typical sorting system developed according to the present invention may involve five color sorting categories and a dozen or more weight sorting categories. Further, a line printer is provided to determine the number of items being delivered to each category.

Because of the electromechanical weighing of the fruit, the accuracy of the weighing system is increased over conventional weighing systems. Thus, it is possible to decrease the overage necessary in conventional systems, which reduces the amount of fruit given away. Also, because the electromechanical weighing means and associated electronics are less susceptible to temperature, vibration and other effects which inherently decrease the accuracy of conventional systems, the speed with which the present system may operate is increased.

In addition, conventional systems typically have not adequately sorted according to color. The present system, in contrast, accurately sorts according to color and can sort either according to color alone or may incorporate the color criteria into the weight sizing criteria.

It is one object of this invention to provide an improved automatic sorting system which has increased accuracy in weighing of the objects to be sorted.

It is another object of this invention to provide an automatic sizing system which may sort according to color.

It is a further object of this invention to provide an automatic sizing system which operates at increased speed.

Other and further objects and advantages of the present system will be apparent from the following detailed description.

IN THE DRAWINGS

FIG. 1 is a schematic illustration of the automatic sorting system.

FIGS. 2*a* and 2*b* are schematic illustrations of the electronics and logic used to categorize the items to be sorted. FIG. 2*a* illustrates the clocking circuitry and the color sorting circuitry, while FIG. 2*b* illustrates the weight sorting circuitry.

FIGS. 3*a*-3*c* illustrate varying views of the electronic scale mechanism.

DETAILED DESCRIPTION OF THE INVENTION

Attention is now directed to FIG. 1, which schematically illustrates the automatic sorting system of the present invention. An item to be sorted 1, typically fruit but not restricted thereto, is delivered from a storage bin 2 onto a series of belt conveyers 3. The belt conveyers 3 align the items to be sorted, such as the item 1, into relative single file arrangements, whereupon the item 1 is conveyed onto a roller conveyer 4. Each belt or roller conveyer 3 feeds a separate roller conveyer 4. Although

the number of roller conveyers 4 may vary, a typical application may use three or more lanes of such roller conveyers. Thus, three or more belt or roller conveyers 3 are typically required althouth it is possible to use only a single conveyor 3 to load all of the roller conveyers 4. A suitable conveyance means is similar to that shown in U.S. Pat. Nos. 2,813,617 or 3,017,013.

Once the item 1 has been deposited on the respective roller conveyer 4, the conveyer 4 moves the item 1 past a pair of optical detection devices 5. Each optical detection device consists of a light source 6 and an optical pick-up 7. The light source 6 illuminates the item 1 and the light is reflected onto the optical pick-up 7, which is electrically connected to amplifier and logic circuitry 8. One of the pair of optical protection devices 5 illuminates and detects from one side of the item 1 and the corresponding detection device 5 determines the color of the opposing side of the item 1. Thus, the total signal is derived from a combination of signals from each side of the item 1.

After the conveyer 4 has moved the item 1 past the optical devices 5, the conveyer 4 discharges the item 1 into a cup 9 carried on a conveyer chain 10. The conveyer chain 10 carries the cup 9 containing the item 1 over an electronic scale 11. The cup 9 and its contents are weighed by electronic scale 11, which sends the resulting signal to amplifier and logic circuitry 8. The cup 9 and its contents consisting of item 1 are typically moved several feet by the conveyer chain 10 before being weighed on the electronic scale 11 to minimize any inaccuracies resulting from vibration or mechanical factors.

Once the item 1 has been weighed by the scale 11, the conveyer chain 10 and cup 9 are moved to a series of drop-out locations 12, where the item will be discharged into a particular storage area. Typically, each conveyer chain 10 passes over a dozen or more drop-out locations 12. The present invention has been operated successfully with up to 24 drop-out locations. Each drop-out location represents a different category for size or color variation.

The determination of size and color category is made by amplifier and logic circuitry 8 in conjunction with manually preset inputs from weight and count adjust circuitry 20 as well as weight and color control circuitry 22 and drop-out location control 24. On the basis of these inputs and the data received from the optical detection devices 5 and the electronic scale 11, amplifier and logic circuitry 8 signals a particular relay in a set of relays 26, which activates particular drop-out solenoid 28. The drop-out solenoids 28 are located in the series of drop-out locations 12, and when activated permit the cup 9 to tilt about the conveyer chain 10, thereby discharging the item 1 into the appropriate sorting location. At the same time, amplifier and logic circuitry 8 feeds a printer interface 30, which consists of counting and storage logic for providing an input to printer 32. Printer 32 provides a record of the number of items sorted into each category.

A shaft encoder 34 is provided at the end of the drop-out locations 12 and is operated by the conveyor chain 10. As each cup 9 carried by the conveyer chain 10 passes the shaft encoder 34, the encoder 34 generates a clocking signal to amplifier and logic circuitry 8, thereby synchronizing the mechanical movement of the item 1 with the electronic positioning of that item.

Referring again to the optical detection devices 5 which are usually housed in a cover (not shown) to avoid ambient light reflection, the light source 6 may consist of a conventional light bulb, for example, a 12 volt DC incandescent bulb, with a focusing lens and a polarizing filter to illuminate an area of the item 1, typically a circle about three inches in diameter. The optical pick-up device 7 typically consists of a polarizing filter (to cut reflective glare) placed in front of a fiber optic light pipe (not shown). By orienting the direction of the polarizing filter on the light source 6 perpendicular to that on the photo 1 pick-up device 7, light from the light source 6 cannot directly enter the pick-up 7. This permits accurate segregation at low light levels. Because the color sorter preferably operates on the two-color theory, which categorizes objects according to how much of each of two colors is found in the object, the fiber bundle (not shown) is typically divided into two halves. The light passing through each half is transmitted through a filter (not shown) a predetermined color (each of the two filters typically having a different color) and thence into an electrically photosensitive device (not shown) preferably a photomultiplier tube although a photodiode is acceptable for many applications. For the sorting of apples, one filter may be green and the other dark red. The two photomultiplier tubes produce a signal proportional to the amount of each color transmitted by the respective filter as found in the item 1. The two signals generated thereby are combined with the signals generated by the other pick-up device 7 in the pair of optical detection devices 5. As noted previously, the four signals generated by the two pick-up devices 7 are then transmitted to the amplifier and logic circuitry 8 where the item 1 is categorized by color according to a predetermined criteria, as discussed hereinafter.

Attention is now directed to FIGS. 2*a* and 2*b*, which illustrate adequately the electronics of the amplifier and logic circuitry 8, relays 26 and the weight and count adjust circuitry 20. Referring to FIG. 2*a*, slotted disc 38 is connected to shaft encoder 34 (FIG. 1), such that with each movement of the shaft encoder 34 a slot on the disc 38 permits a lamp 40 to illuminate a photodiode 42. The photodiode 42 is connected across the inputs of an op amp and associated biasing circuitry 44 to amplify the signal from the photodiode 42. The output of the op amp 44 is fed into a comparator 46. Comparator 46 and biasing circuitry 48 provide high and low logic levels suitable for performing logic functions. An inverter 50 performs level shifting and inversion functions and generates a signal suitable for use with conventional digital logic devices. The signal generated by the inverter 50 is again inverted by inverters 52, which supplies a clocking signal 56 to the weight sorting circuitry shown in FIG. 2*b*, and inverters 54 and 55, which supply a clocking signal 57 to the color sorting circuitry discussed below. It can be seen that the clock signals 56 and 57 are generated by the shaft encoder 34, and that the shaft encoder is operated by the conveyer chain 10. It will be remembered that conveyer chain 10 carries the cup 9 containing the item 1 to be sorted. Thus, the clock signal 56 is in synchronization with the movement of the item 1. An alternative to the lamp 40 and photodiode 42, a magnetically actuated mercury switch may be used.

As previously discussed in connection with FIG. 1, the light source 6 from each side of the item 1 illuminates, through a focusing lens and a polarizing filter, an area typically about 3 inches in diameter that side of the item 1. The reflected light passes into the polarizing filter, focusing lens and fiber optic bundles comprising

the optical pick-up 6 from each of the pair of optical detection devices 5. As further previously described, the fiber optic bundles from each pick-up 7 are split into halves: one half of the bundle from each pick-up 7 is combined with one half of the bundle from the opposing pick-up 7, thereby effectively summing the light from one side of the item 1 with that from the other side of the item. The light transmitted through the combined bundle is then passed through a first color filter (example, dark red) and into a photomultiplier tube 100, shown in FIG. 2*a*. The remaining halves of the fiber optic bundles are similarly combined, and the light transmitted therethrough is passed through a filter of a second color (example, green) and thence into a second photomultiplier tube 102.

The output of the photomultiplier 100 is then fed into op amp (and associated biasing circuitry) 104 and the output of photomultiplier 102 is fed into op amp 106, where the signals are amplified. The output of op amp 104 is then fed into one input of a series of comparators, for purposes of example comparators 112, 114, 116 and 118. The remaining input to the comparators 112, 114, 116 and 118 is derived from the output of op amp 106 by passing the output through a voltage divider comprised of a variable resistor with one terminal grounded. Thus the second input of the comparator 112 is the output of op amp 106 passed through variable resistor 107, the output of op amp 106 is passed through variable resistor 108 to provide the second input to comparator 114, the output of op amp 106 is passed through resistor 109 to comparator 116, and through resistor 110 to comparator 118.

By varying the position of the slide on variable resistors 107, 108, 109 and 110, the respective comparators 112, 114, 116 and 118 generate outputs proportional to a range of colors of the item 1. For example, assume a green filter is placed between the fiber optic bundle and photomultiplier 102, and a red filter between the fiber optic bundle and photomultiplier 100 (the lighter colored filter is usually used in the channel having the variable resistors), and variable resistors 107, 108, 109 and 110 are set to provide decreasing resistance. Then, a light green apple will cause a large magnitude signal from op amp 106 and a much smaller signal from op amp 104. Thus, the output of all comparators 112, 114, 116 and 118 may be a low level, or "zero." Conversely, a very dark red apple may cause a much larger signal from op amp 104 than op amp 106, in which case, depending on the setting of the variable resistors 107, 108, 109 and 110, the comparators 112, 114, 116, and 118 may have a high level ("one") output. Varying shades of red may cause a series of combinations of outputs from the comparators, although those skilled in the art will recognize that only five classifications by color are possible with only four comparators. Clearly, more classifications are possible merely by adding more variable resistors and comparators. Thus, it can be seen that the use of two signals with variable resistors and comparators will permit automatic categorizing of the item 1 by color.

To synchronize the color information derived from the comparators 112, 114, 116 and 118, the outputs of the comparators 112, 114, 116 and 118 are clocked into shift registers 120, 122, 124 and 126, respectively, by the clocking signal 57 developed from the shaft encoder 34. The shift registers 120, 122, 124 and 126 are typically of CMOS construction to avoid voltage level shifting problems, and clock on the negative clock transition, although those skilled in the art will recognize that many obvious variations exist without departure from the spirit of the invention disclosed herein. The shift registers 120, 122, 124 and 126 synchronize the color data of the item 1 with its position while the item 1 is moving from the optical detection devices 5 to the electronic scale 11 (FIG. 1); the size of the particular shift register thus depends on the distance from the detection device 5 to the scale 11. As will be recognized by those skilled in the art, the present invention could really be configured to permit weighing the item 1 in scale 11 before categorizing the item 1 by color.

When the item 1 has reached the electronic scale 11, the color data associated with that item will be clocked onto the outputs of the shift registers 120, 122, 124 and 126. The outputs are then fed into logic network 128 to complete the color sorting of the item 1.

A logic network 128 is arranged to provide five categories of color sorting, with a high signal appearing only on the output which corresponds to the proper color category of the item 1. Thus, as shown in FIG. 2*a*, the output of shift register 120 feeds inverter 130. Inverter 130 in turn feeds an output of the logic network 128 and one input of a two-input nor gate 132. The remaining input of the nor gate 132 is supplied by the output of shift register 122, which output also feeds an inverter 134. The output of the nor gate 132 provides a second output of the logic network 128. The inverter 134 supplies one input of a two input nor gate 136, the other input of which is supplied by the shift register 124 and the output of which supplies a third output of the logic network 128. The output of the shift register 124 also supplies an input to an inverter 138, which in turn provides one input to a fourth two input nor gate 140, the output of which supplies the fourth output of the logic network 128. The remaining input of the nor gate 140 is provided by the shift register 126 which also provides a fifth output of the network 128. Should additional color sorting channels be desired, the necessary shift registers and logic circuitry would be analogous to those described herein.

To illustrate the operation of the logic network 128, let it be assumed that a very light green apple causes a "zero" on the output of all four comparators, while a very dark red apple causes a "one" on all four comparator outputs. Then, assuming that item 1 is a very light green apple, the outputs of a four comparators 112, 114, 116 and 118 are low and, after the proper clocking delay, the outputs of all four shift registers will be low. Then the output of inverter 130 will be high while the output of the nor gates 132, 136 and 140, as well as the output of the shift register 126, will all be low. Conversely, if the item 1 is a dark red apple, the outputs of all four shift registers will be high, in which case the output of shift register 126 is high and the outputs of nor gates 132, 136 and 140 and inverter 130 are all low. The remaining combinations and corresponding outputs follow analogously. Thus, the logic network provides a single high output which corresponds to the color category of the item 1. As will be discussed in connection with FIG. 2*b*, the color sorter outputs of the logic network 128 are combined with the weight category of the item 1 to determine the final drop-out location.

Attention is now directed to FIG. 2*b*, which schematically illustrates the weighing circuit and associated logic for determining the weight and color category into which the item 1 should be placed. With reference to FIG. 1, when the cup 9 containing the item 1 to be

weighed passes the electronic scale 11, the cup 9 and its contents cause a force on transducer 200, typically a strain gauge, which generates a signal in proportion to the weight of the item 1 (neglecting the weight of the cup 9). A transducer suitable for use with the present invention is the Statham Linear Displacement Accessory, Model UD3. The signal generated by the transducer 200 is fed into a comparator 202 which generates a positive or negative signal. The output of the comparator 2 is then fed through a resistor 204 and summed with a reference voltage generated by variable resistor 206 and resistor 208 in conjunction with a positive voltage source. The sum of the voltages then feeds the input of an op amp and associated feedback network 210. The signal generated by the op amp 210 is thus seen to be proportional to the weight of the item 1. The output of the op amp 210 is then fed into a series of comparators, the exact number of which is arbitrary and limited only by the number of dropout locations which the user prefers to employ. For purposes of the present example, it will be assumed that there are twelve comparators into which the signal from the op amp 210 is fed as one input. Thus it can be seen that the signal is fed into comparators 212, 214, 216 and 218. It will be noted that only four comparators of the 12 are shown since the omitted comparators and associated logic circuitry are analogous to those shown. The remaining input to the comparators 212 through 218 is a reference voltage set by the weight and count adjust circuitry 20.

Weight and count adjust circuitry 20 may be suitable circuitry for generating a series of incremental reference voltages which are adjustable according to the range of weights of the item to be sorted. That is, assuming that 12 weight categories are desired, weight and count adjust circuitry 20 provides 12 reference voltages, each of which indicates one reference category. However, since the present invention is intended to be used to sort items which may vary broadly over a range of weights, weight and count adjust circuitry 20 must be able to be adjusted to provide a varying range of incremental reference voltages. For example, weight and count adjust circuitry may comprise merely a series of resistive elements connected to a single reference voltage, or adjust circuitry 20 may comprise multiple voltages variable through more complex or sophisticated logic circuitry. Further, the number of weight categories into which the item 1 may be sorted is arbitrary and thus the weight and count adjust circuitry may be required to have any number of reference voltage outputs.

The first voltage output 220 of adjust circuitry 20 is fed through a resistor 222 and summed at the inut of op amp and associated feedback loop 224 with a reference voltage derived from voltage source 226, variable resistor 228 and resistor 230. The output of op amp 224 is then fed into the first comparator 212. Only the circuitry for generating a first reference voltage as applied to comparator 212 is shown since the circuitry for generating reference voltages 2 through 12 for input into comparators 214 through 218, respectively, is identical. The only difference will be the reference voltage supplied by weight and count adjust circuitry 220. At this point, a first reference voltage 232 is applied to the input of the comparator 212 and a voltage 234 which is proportional to the weight of the item 1 as determined by the electronic scale 11 is supplied to the other input of comparator 212. Depending upon the magnitude of the voltage signal 234, and the reference voltage 232, the output of comparator 212 either goes to a high level or a low level.

Let it further be assumed, for purposes of example, that the reference voltage 232 indicates the maximum weight category into which the item 1 may be sorted, and that the reference voltages incrementally decrease until the twelfth reference voltage 236 supplied to comparator 218 indicates the minimum weight category into which the item 1 may be sorted. Thus, the item 1 is sorted into the category indicated by reference voltage 236 only if the voltage signal 234 is less than the reference voltage 236. It will be noted that if there are only twelve categories into which the item 1 may be sorted, the reference voltage 232 must be set for a magnitude greater than the maximum which voltage signal 234 may achieve. Thus the maximum weight category indicated by the output of comparator 212 consists of those items which fall between the reference voltage 238 supplied to comparator 214 and reference voltage 232 supplied to comparator 212. In this event, the output of comparator 212 is always low.

For purposes of example, let is be assumed that the weight of the item 1 is sufficient to cause the voltage signal 234 to fall between the reference voltages 239 and 232. In this event, the output of comparator 214 will be high while the output of comparator 212 will be low. The output of comparator 212 is then fed through a diode 240 and resistor 241 to provide level shifting and current stabilization. Because the logic circuitry preferably employed is CMOS technology, level shifting circuits are not greatly needed. Similarly, the output of the comparator 214 is passed through a diode 242 and resistor 243. Similarly, the output of the comparator 216 feeds a diode 244, which in turn feeds a resistor 245, and the comparator 218 feeds a diode 246 which in turn feeds a resistor 247.

The signals passing through the resistors 241, 243, 245 and 247 are then fed into a logic network analogous to the logic network 128 used in the color sorting circuit shown in FIG. 2a. That is, the signal from the comparator 212 is fed into one input of a two input nor gate 254, the other input of which is fed by an inverter 250 which is controlled by the signal from the comparator 214. The signal from the comparator 214 also feeds one input of a two input nor gate 252. The remaining input of the nor gate 252 is provided by an inverter 256, which is controlled by one of omitted comparators. The inverter 256 may be analogized to an inverter 258. The inverter 258 is controlled by the signal from the comparator 216, which also supplied one input to a two input nor gate 260. The remaining input to the nor gate 260 is supplied by an inverter 262, analogous to the inverter 130 in the logic network 128 (FIG. 2a), which is controlled by the comparator 218. Thus, 12 weight categories are provided by the twelve comparators, and associated inverters and nor gates. By analogy to the shift register 126, a thirteenth weight category may be provided by use of a signal directly from the comparator 212.

The outputs of the inverter 262 and the nor gates 252, 254, 260, and those omitted, thus provide a single high output, the remaining outputs being low, and the high output indicates the weight category of the item 1. The outputs of the inverter 262 and the nor gates 252, 254 and 260 are combined with signals from the color sorter outputs of the logic network 128, shown in FIG. 2a, by "and"ing the weight signal with the color signal in and gates 264, 268, 270 and 266, respectively, to determine the ultimate category into which the item 1 will be

sorted. It should be noted that the present example provides five color categories and twelve weight categories, or a total of sixty possible categories into which an item 1 might be sorted. Since a typical application may use only 24, or less, categories, many applications ignore possible categories. Thus, the user typically choses the interrelationship of color and weight categories suitable for his application. Thus, one of the inputs to the and gates 264, 266, 268 and 270 is shown as merely from the color sorter outputs of the logic network 128.

Since only one weight category provides a high output, and only one color category provides a high output, only one of the and gates 264, 266, 268 and 270 will provide a high output, and all others will provide a low output. The outputs of the an gates 264, 266, 268 and 270 are then clocked into a series of shift registers 272, 274, 276 and 278, respectively, by a clocking signal 56 provided by the shaft encoder 34, which also provides the clocking signal 57 to the color sort circuit shown in FIG. 2a. Thus, the shift registers 272, 274, 276 and 278 indicate the position of the item 1 after it passes from the electronic scale 11 into the dropout locations 12 (FIG. 1). The size (number of bits) of the shift registers 272, 274, 276 and 278 varies depending upon the total number of dropout locations, and upon the desired dropout location for a particular category.

For example, it may be that the dark red, heaviest apples should be dropped out at the first location, while the smallest light green apples should be dropped out at the sixtieth location. In such event, the shift register associated with the heaviest dark red apple will be only one bit, while the shift register associated with the small green apples will provide sixty bits of storage. This permits automatic sorting in the following manner. When the high logic level associated with the Item 1 appears at the output of its respective shift registers, for example the shift register 272, that logic level saturates a driver transistor 280. The collector of the transistor 280 is connected to one terminal of the coil of a reed relay 282, the other terminal of which is connected to a positive supply voltage. The associated relay contacts 284 close when the transistor 280 saturates, thus causing a dropout solenoid 28 (FIG. 1) to energize, which pulls back a portion of the track on which the cup 9 (FIG. 1) rides, thereby allowing the cup 8 to tilt discharging the Item 1 into the proper location. Transient protection is provided by capacitor 286 across the terminals of relay contacts 284 and by diode 288 across the terminals of relay coil 282. The remaining shift registers, all of varying size to permit sorting at varying locations, are similarly associated with driver transistors and relays. Thus, shift register 274 controls a dropout location through transistor 290, coil 292, contacts 296, capacitor 298 and diode 294. The shift register 276 controls a dropout location through a transistor 300, the coil 302, contacts 303, capacitor 304 and diode 306, while shift register 278 is similarly connected to transistor 308, coil 310, contacts 312, capacitor 314 and diode 316.

As will be recognized by those skilled in the art, the dropout location for a particular category may be altered by changing which and gate supplies an input to a particular shift register. Thus, a patch cord board may be provided to soft wire the and gate output to the desired shift registers, just as a patch cord board may be provided to let the user associate a particular weight category with a particular color category. Further, switch means may be provided at the inputs to the and gates to block the weight category inputs, thus permitting the use of only the color sort circuitry, or to block the color category inputs and thus sort only by weight.

Also provided is a printer interface 30 and printer 32, which have inputs supplied by the outputs of the shift registers 272, 274, 276 and 278. The printer interface provides a random access memory and accounting logic which permits the printer 32 to print out, when activated, the number of items of each category during a period of sorting. This permits a running tally of the number of items in each category to be automatically maintained, thereby easing accounting problems.

Attention is now directed to FIGS. 3a-3c, which illustrate the electronic scale 11 in greater detail. Referring to FIG. 3a, it can be seen that the electronic scale 11 comprises a weigher section 400, discussed in connection with FIG. 3b, and a damping section 402, discussed in connection with FIG. 3c, connected by a pair of scale arms 404 and supported and enclosed within a housing 406. The scale arms 404 pivot about a pivot shaft 408 through needle bearings 410. The needle bearings 410 are positioned by a set screw or other means on the pivot shaft 408 so as to prevent lateral movement of scale arms 404 along the shaft 408. The shaft 408 is further supported by the housing 406.

Referring to FIG. 3b, the weigher section 400, over which the cup 9 and its contents pass, is comprised of a scale runner 412 connected to a weigher arm 414 by means of screws 416. Slots are provided in the scale runner 412 so that the height of the scale runner 412 may be adjusted. The weight of the cup 9 - item 1 combination is transferred to the strain gauge 200 (as shown in FIG. 2b) mounted directly below the center of the scale runner 412, through rubber pad 420, compression spring 422 and strain gauge force adaptor 424. The compression spring 422 is held in position by the spring guide shaft 426 which screws directly into the adaptor 424. Vertical movement of the weigher arm 414 is permitted by slots in the housing 406. The rubber pad 420 mounts on the weigher arm 414 and directly contacts the spring 422.

To avoid excessive vibration of the cup 9 as it moves onto the scale runner 412, a micarta rail 426 or other rail with a low coefficient of friction is beveled to provide a smooth transition from the rail 426 onto the runner 412. The cup 9 is drawn along the rail by the conveyor chain 10, discussed in connection with FIG. 1. The cup 9 is connected to the conveyor chain 10 by means of a pivot cross rod, and is maintained in a horizontal position by a supporting cross rod 430 which rests on a track of which the micarta rail 426 is a part. During weighing the supporting cross rod 430 rests on the scale runner 412, located at a break in the micarta rail 426. By using a scale runner 412 which extends across the entire break in the rail 426 and is connected to the weigher arm 414 at both sides of the housing 406, the weight of the cup 9 - item 1 combination may be taken at any time while the cup 9 is over the scale runner 412. However, to minimize any vibration which may result from the transition between the rail 426 and scale runner 412, the weight is preferably taken just before the cup 9 exits the scale runner 412.

To avoid erroneous signals from the strain gauge 200 and thereby to permit accurate weighing of the cup 9 and its contents in 1/10 of a second or less with cups traveling 3 feet per second, the damping section 402 shown generally in FIG. 3a and in greater detail in FIG 3c is provided. The damping section 402 comprises a

damping arm 432 connected between the pair of scale arms 404 and connected at its center to a dashpot plunger 434. The dashpot plunger 434 protrudes into a damper body 436 filled with a damping fluid 438. The damper body is mounted on the housing 406 by a screw or other means. By adjusting the visosity of the damping fluid and the compliance of the compression spring 422 (FIG. 3*b*), the signal transmitted by the strain gauge 200 (FIG. 3*b*) will have a minimum of bounce, or overshoot and undershoot, in a minimum time period. Silicon damping fluid has been found suitable for some applications although the fluid viscosity and compliance of the spring 422 will vary depending on the range of weights of the item 1. Accuracy within ±2% has been achieved in 1/10 second or less using round weighted balls in a cup traveling 3 feet per second.

Thus it can be seen that the invention disclosed herein provides an improved apparatus for automatically sorting items such as fruit and the like according to color, weight, or both.

Having fully described the invention it is to be understood that it is not to be limited to the details herein set forth, but that the invention is of the full scope of the appended claims.

We claim:

1. An automatic sorting apparatus comprising conveyance means for transporting a plurality of items to be sorted along a track and having individual cups for transporting each said item, said individual cups being connected in a continuous belt,

electronic weighing means incorporated into a portion of said track for generating a signal proportional to the weight of said item to be sorted,

reference signal means for providing a predetermined number of reference signals, the value of each signal established according to a predetermined criteria,

comparison means for comparing the signal generated by said electronic weighing means to the reference signals provided by said reference signal means,

clock means for incrementally signalling changes in position of an item to be sorted,

first position indicating means responsive to the signal from said clock means and the signal from said comparison means for generating a signal indicative of the position of the item to be sorted, and

discharge means responsive to the signal generated by said position indicating means for discharging the item to be sorted at a predetermined position.

2. The apparatus of claim 1 wherein

said electronic weighing means comprises a strain guage.

3. An automatic sorting apparatus comprising

optical detection means for generating at least two reflectance signals, each proportional to the color of an item to be sorted, but responsive to different wavelengths of reflected light,

reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria, said reference signal means having an input provided by the first of said two reflectance signals,

comparison means for comparing the second of said two reflectance signals generated by said optical detection means to the reference signals provided by the said reference signals means for generating a signal therefrom,

clock means for incrementally signaling changes in position of an item to be sorted, and

first position indicating means responsive to the signal from said clock means and the signal from said comparison means for generating a signal indicative of the position of an item to be SORTED.

4. The apparatus of claim 3 further comprising:

discharge means responsive to the signal generated by said position indicating means and said clock means for discharging the item to be sorted at a predetermined position.

5. The apparatus of claim 3 wherein said optical detection means comprises

light source means for iluminating an area of an object to be sorted; and

optical pickup means sensitive to light reflected from the object to be sorted, said light source means and said optical pickup means being relatively positioned so that light from said light source means is reflected from the item to be sorted into said pickup means.

6. The apparatus of claim 5 wherein said optical pickup means further comprises a polarizing filter.

7. The apparatus of claim 6 wherein said light source means further comprises a polarizing filter positioned so as to prevent stray light from said light source means from entering said pickup means.

8. The apparatus of claim 7 wherein said light source means and said optical pickup means each further include a focusing lens.

9. The apparatus of claim 7 wherein said optical pickup means further includes fiber optic means for relaying light reflected from the item to be sorted to a light sensing means for detecting variations in the magnitude of the reflected light.

10. An automatic sorting apparatus comprising

electronic weighing means for generating a signal proportional to the weight of an item to be sorted.

first reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria,

first comparison means for comparing the signal generated by said electronic weighing means to the reference signals provided by said first reference signals means,

optical detection means for generating a signal proportional to the color of an item to be sorted,

second reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria,

second comparison means for comparing the signal generated by said optical detection means to the reference signals provided by said second reference signals means, and generating a signal therefrom,

clock means for incrementally signaling changes in the position of the item to be sorted,

first position indicating means responsive to a signal from said clock means and said signal from said second comparison means for continuously indicating the position of an item to be sorted while the item is in transit between said optical detection means and said electronic weighing means,

second position indicating means responsive to the signal from said clock means, the signal from said

first comparison means and said first position indicating means for generating a signal continuously indicative of the position of an item to be sorted after said item has been weighed, and

discharge means responsive to the signal from said second position indicating means for discharging the item at a predetermined one of a plurality of sorting positions.

11. The apparatus of claim 10 wherein said optical detection means comprises a polarized light source means and a polarized optical pickup means, the polarization of the light source means being arranged relative to the polarization of the optical pickup means such that no light from said light source means may be reflected directly into said optical pickup means, said light source means and said pickup means being mutually positioned relative to an item to be sorted such that light from said light source means is reflected by the item to be sorted into said optical pickup means.

12. The apparatus of claim 11 wherein said optical pickup means further includes fiber optic means for relaying light to optical sensing means for detecting the magnitude of the reflected light.

13. The apparatus of claim 12 wherein

said fiber optic means relays light reflected from the item to be sorted through a filter of a first color into one of said optical sensing means, and through a filter of a second color into a second of said optical sensing means, the magnitude of the signal received by the first of said optical sensing means being compared with the magnitude of the signal received by the second of said optical sensing means according to a predetermined criteria to sort an item into one of a range of color categories.

14. An automatic sorting apparatus comprising

optical detection means for generating at least two signals, the first of said signals being proportional to the reflectance of an item to be sorted at a first frequency, and the second of said signals being proportional to the reflectance of said item at an second frequency,

reference signal means for providing a predetermined number of reference signals, the value of each reference signal being established according to a predetermined criteria and said reference signal means having an input provided by said first signal generated by said optical detection means, and

comparison means for comparing the second signal generated by said optical detection means to the reference signals provided by said reference signal means and generating a signal therefrom.

15. The apparatus of claim 14 wherein said optical detection means comprises

light source means for illuminating an area of said item to be sorted, and

optical pickup means sensitive to light reflected from said object to be sorted, said light source means and said optical pickup means being relatively positioned so that light from said light source means is reflected from said item into said pickup means.

16. The apparatus of claim 15 wherein said optical pickup means further comprises a polarizing filter.

17. An automatic sorting apparatus comprising

conveyance means for transporting an item to be sorted along a track and having individual cups for transporting each said item,

electronic weighing means incorporated into a portion of said track for generating a signal proportional to the weight of said item to be sorted, said electronic weighing means comprising a transducer means connected to a first member through a spring, a damping means connected to a second member for decreasing the overshoot of said transducer means in response to a force from the item to be sorted, said damping means being connected to said transducer means by a pair of members connecting said first and second member, and said pair of members being pivotally supported,

reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria,

comparison means for comparing the signal generated by said electronic weighing means to the reference signals provided by said reference signal means,

clock means for incrementally signaling changes in position of the item to be sorted,

first position indicating means responsive to the signal from said clock means and the signal from said comparison means for generating a signal indicative of the position of the item to be sorted, and

discharge means responsive to the signal generated by said position indicating means for discharging the item to be sorted at a predetermined position.

18. An automatic sorting apparatus comprising

electronic weighing means for generating a signal proportional to the weight of an item to be sorted,

first reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria,

first comparison means for comparing the signal generated by said electronic weighing means to the reference signals provided by said first reference signal means, and generating a signal therefrom,

optical detection means for generating a signal proportional to the color of an item to be sorted,

second reference signal means for providing a predetermined number of reference signals, the value of each signal being established according to a predetermined criteria,

second comparison means for comparing the signal generated by said optical detection means to the signals provided by said second reference signal means, and generating a signal therefrom,

clock means for incrementally signalling changes in position of the item to be sorted,

first position indicating means responsive to a signal from said clock means and the signal from a first one of said first and second comparison means for generating a signal continuously indicative of the position of an item to be sorted while the item is in transit between a first one of said optical detection means or said electronic weighing means, and the other of said optical detection means or said electronic weighing means,

second position indicating means responsive to the signal from said clock means, the signal from said first position indicating means, and the signal from the other of said first and second comparison means for generating a signal continuously indicative of the position of the item to be sorted after the item has passed the other of said optical detection means and said electronic weighing means, and

discharge means responsive to the signal from said second position indicating means for discharging the item at a predetermined one of a plurality of sorting positions.

* * * * *

APPEAL NOS. 85-1882 and 85-1933

PRINCESS ORCHARDS DIVISION

A&B ALEXANDER & BALDWIN, INC.

P. O. BOX 156 • KAHULUI, HAWAII 96732

PURCHASE ORDER

No. 0128

Date: 2/20/75

Sheet

NOTICE TO VENDORS

Please enter order for our account for items noted below, subject to terms and conditions on reverse hereof. Make no substitutions without our authority.

INVOICES: Air mail five copies showing purchase order number and shipping marks.

INSURANCE: DO NOT INSURE. This order will be covered under our Open Marine and War Risk Policies.

All numbers and marks shown below must be on all invoices, packages and documents.

To:

Tilt-Belt Systems, Inc.
Post Office Box 218
Traver, California 93673

ATTENTION: Mr. A. J. Warkentin

SHIPPING INSTRUCTIONS:

MARK

Matson Sturedoor Van
Ron Sharples
Princess Orchards
Kahului, Maui, Hawaii

COST CONTROL

ACCOUNT NO. 74-12

ITEM	QUANTITY	DESCRIPTION	LIST	DISCOUNT	ESTIMATED SHIPPING DATE
	1	Used conveyor	375.00		2/20/75
	1	Used water dump with elevator, complete with motors, starters, reconditioned and modified to fit grading line. Capacity: 20 bins per hour.	4,500.00		4/01/75
	1	Used 48" washer and clorinator. Reconditioned and complete with all motors and starter.	1,500.00		
	1	Reconditioned 8' grading table with three take out conveyors.	1,750.00		
	1	Singulator and electronic weight sizer: Four size categories; design capacity, five pieces of fruit per second. Includes take out conveyors.	13,000.00		
	2	Reconditioned Pomona bin fillers	2,200.00		
		All above, FOB Traver, CA	$ 23,325.00		
		Payment: $7,500.00 with order 8,000.00 on delivery 7,825.00 30 days after installation.			

(Back Order) (Cancel) If not in stock

NOTE: Complete Purchase-Order number must appear on parcel post and air freight shipments

EXHIBIT D-154

Alexander & Baldwin, Inc., Agent

By _____
Buyer

APPEAL NOS. 85-1882 and 85-1933

mlh

PTO-55

U. S. DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

January 12, 1982
(Date)

THIS IS TO CERTIFY that the annexed is a true copy from the records of this office of the Printed Specification and Drawings of U. S. Patent 4,106,628.

By authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

Certifying Officer.

APPEAL NOS. 85-1882 and 85-1933

MEMO

February 19, 1975

TO: DEE HUNTER

FROM: BOB WILLIAMSON

RE: TILT BELT'S NEW ELECTRONIC SORTER/SIZER

cc: Ralph, PAT FREEMAN

Monday, February 17, I met with Jim Warkentin of Tilt Belt who was in Yakima finishing up his installation at Inland Fruit Company. He has installed traypacking units and several weight fillers at this packinghouse. Since he was pressed for time, he asked for an evening meeting to explain his new unit.

It seems that several months ago, Jim began negotiations with a gentleman who was formerly in the aerospace industry as a lead engineer for Lockheed. Jim had the idea of sorting and sizing so that the size and grade of every apple was known and this gentleman was able to lend the electronic knowledge to implement the system.

In floor space of 151 ft. long by 80 ft. wide, Tilt Belt is able to install a complete system beginning with the T dump and continuing through to pallet box filling. This cost for the whole combination is to be $300,000 in its most simple form. (The sizer has a price tag of $125,000 for an eight-lane unit.)

The basic unit is the electronic sizer/sorter consisting of five 10 ft. sections. The concept is to use eight lanes and 22-16" wide pullout belts dumping into flumes. The 22 pullout belts will accommodate 11 sizes each of two grades.

Singulation to the machine is right angle from one set of wide rollers to a narrow set of rollers feeding the fruit in-line to the sizing apparatus. Basically, a strain gauge is used to weight-size the apple and a separate device is used to color sort. A computing or electronic device (as usual, Jim is not very detailed on these items) makes note of the weight and color of each particular apple and drops it out in one of the 22 lanes.

The system has one electronic unit per lane. When the lane goes down, the replacement of a $100 spare logic card will put the unit back in operation again.

Jim speaks in terms of five fruit per second in each lane and states that the overall system will handle 60 bins per hour.

Jim reports the unit is capable of adjusting the size spread for different lots of fruit. In other words, if the size-to-weight ratio of a lot happens to change slightly, then the unit can detect this and compensate by the time 20 fruit have passed through the unit.

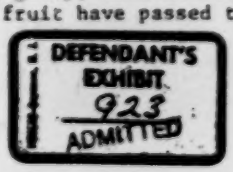


Exhibit 6 Date 9-21-81
Witness Williamson

APPEAL NOS. 85-1882 and 85-1933

It still will be necessary to manually sort out the defects, but Jim states he is working on a system that is fairly foolproof for doing this and could plug into his electronic sorter/sizer.

A customer would need to spend approximately $10,000 for a computer and a teletype to record the size and grade as detected by the unit or this information could be sent to a central computer in the office.

The amazing thing about this system is that only one pallet box filler is used. Jim has gone to an extremely sturdy plastic pipe for fluming and accumulating the apples until the filler is ready to receive them. He contains there is no "wait" time and that each lane or flume is emptied once the correct count is reached and ready for the filler. He claims to be off no more than 5 to 10 apples in each pallet box.

Jim states one of the big factors in reliability is that his designer has used standard off-the-shelf components for every part of the new equipment. Evidently these components are guaranteed by the manufacturer for so many uses, such as 50,000 uses or 100,000,000 and a selection can be made depending upon the price range you wish to pay.

Jim contends the unit is outstandingly reliable in the tests they have conducted so far. Customers to date are:

1. Princess Orchards - who is buying a single line machine for their papaya operation in Hawaii.

2. Wenatchee-Wenoka - who are buying a modified version to fit with some existing equipment. Jim reports this may be installed as early as May.

3. Six to eight units in Canadian packinghouses.

4. Diamond Fruit Growers, Hood River - with whom Jim is meeting Wednesday, February 18. (Jim did mention that Diamond is putting up a new building to house this setup. I believe the building was already committed for conventional wet system but Lefty may change plans and buy the Tilt Belt unit.)

JRW:scb